# THE
# AMERICAN JOURNAL
# OF THE
# MEDICAL SCIENCES.

---

## Art. I. *Personal Observations and Experience of Epidemic or Malignant Cholera in the City of Philadelphia.* By Samuel Jackson, M. D. Assistant to the Professor of the Institutes and Practice of Medicine and Clinical Practice in the University of Pennsylvania. [With two plates.]

HAD the numerous publications made since the occurrence of malignant cholera in its epidemic character been successful in establishing fixed principles in regard to its pathology or treatment, it would be unnecessary to swell the vast catalogue by new additions. Unfortunately this desirable result appears yet far distant, and it may be doubted whether any very close approximations have even been attained. While these important questions remain undetermined, while they continue to be the subjects of controversy, it is the duty of those who are favoured with extensive opportunities of observation, to continue to offer, in a candid spirit, unprejudiced statements of their experience and investigations on this formidable yet obscure disease.

The following observations hastily thrown together, are the results of my own personal experience, investigations and reflexions on the cholera as it has presented itself to me in this city, where it has so lately prevailed as an epidemic, in Montreal in the latter end of June and beginning of July, and in New York. The facts may be relied on, and may serve for others to form their own conclusions. The inductions I draw from those facts are my mode of understanding them—my method of viewing them, and are influenced by the anatomical and physiological principles I entertain—or the doctrines I have formed of the animal organization. They may be true—they may be false. Time, observation, experience are the tests to which they are submitted. Having no other object but truth in view, they are not nurtured with a pertinacious spirit, and will be relinquished when other explanations of the nature of the symptoms, their mode of production, the elements of their composition, and their essential characters, shall be sustained by stronger demonstrative evidence, or more logical induction.

The succeeding general statistics of cholera will present some interesting lights, and may afford some insight into its general character.

The date of its appearance at Quebec, the first point known where the pestilential or epidemic influence reached our continent, or displayed its effects, was the 8th of June. It is distant from Scotland, the nearest point of the European continent where cholera was prevailing, about 3,000 miles. At Montreal, distant 180 miles from Quebec, it commenced on the 10th of June. In both places it spread with great rapidity, and in a very short period in both cities reached its maximum of daily cases and deaths. In Quebec this was on the 15th of June; in Montreal it occurred on the 19th of June—nine days from the commencement of the epidemic. It continued to prevail until the close of September—a period of three months.

The course of the epidemic in Canada was along the St. Lawrence, affecting the villages that line its banks, and extending to the farms of the open country. From the St. Lawrence it spread along the shores of Ontario, skirted Lake Erie, arrived at Detroit, and has penetrated by Lake Superior to the Mississippi.

The routes or lines of communication leading from the St. Lawrence to the United States, do not appear to have been the means of conducting it into our territories, or infecting our cities, notwithstanding the number of emigrants and others who penetrated into the country in those directions.

The disease first manifested itself in New York, June 24th. The subject of it was an old inhabitant of the city. The next four cases were in a different location, and occurred in the persons of Irish emigrants who had arrived at Quebec in the autumn of 1831, and had been residing in Albany from September to May, when they removed to New York. On the 27th of June a case of cholera displayed itself in the Bellevue Alms-house, three miles from the city, in an old woman who had been confined to the house for three years. It was not possible to trace it to any communication. In this establishment the epidemic was very fatal. It reached its maximum July 11th, and terminated August 4th. The whole number of cases was 530; the deaths, 298.

The Board of Health began to report the cases of the disease July 4th, when seven cases were announced. The climax of the epidemic arrived July 21st. It has since regularly declined.

The period from the appearance of cholera at Quebec, and to its appearance at Bellevue Alms-house, is nineteen days, and in the city of New York sixteen days. The distance in a direct line is about 450 miles.

All the cities and towns on the sea-board intermediate to these two points, Quebec and New York, were at this time unaffected with the disease, and with the exception of a very limited number of cases in New Haven, Newport, Providence and Boston, the others have remained entirely exempted from its visitation.

From the apparent progress of the disease from Asia into Europe, it was supposed to have been transmitted along the great routes communicating from one country to another. In the instance of Quebec and New York this general fact meets a contradiction. The disease commencing at Quebec ascended the St. Lawrence, and passed along the Lakes, until it reached the Mississippi and Missouri. It did not follow the land-route into the states.

In New York the disease commenced without a possibility to trace its immediate origin. The next point it struck was Albany, 180 miles above New York, on the Hudson, where it was manifested on the 3d and 4th of July, eight to ten days after its appearance in New York. Many of the intermediate towns have since been afflicted with its visitation.

In this city the first case of the disease occurred July 5th. The individual resided in the western part of the city, near the Schuylkill. No possible circumstance to account for the disease by communication existed. He had been affected with diarrhœa previously for three weeks. The second case took place in the Northern Liberties, distant from the location of the first at least a mile and a half, on the 9th of July. The next cases were on the 14th of July; two in Northern Liberties and one in Kensington; the first distant from the second case about a mile; the last about two miles. A few other scattered cases presented themselves at intervals, all in remote, unconnected points, until the 27th and 28th of July, when the epidemic influence acquired its full sway, and cases were daily developed. The epidemic attained its acmé on the 5th, 6th, and 7th of August, from which time it rapidly declined.

Taking the 27th of July as the proper commencement of the epidemic in Philadelphia, and the 1st of July as the same epoch in New York, we have twenty-seven days for the transmission of the epidemic. The distance in a direct line is between eighty and ninety miles.

The following table exhibits the cases and deaths in Quebec, Montreal, New York and Philadelphia, with the ratios of cases and deaths to population, and to each other. It is defective, as the reports obtained do not include the whole period of the epidemic, but it will serve to give a view of the disease in those cities respectively.

| Date of report and place. | Population. | Cases. | Deaths. | Ratio of cases to population. | Ratio of deaths to cases. | Ratio of deaths to population. |
|---|---|---|---|---|---|---|
| Sept. 2, Quebec - | 32,000* | 5783 | 2218 | 1 in 5 1-7 | 1 to 2½ | 1 in 14½ |
| 21, Montreal - | 28,000† | 4420 | 1904 | 1 in 6 | 1 to 2⅓ | 1 in 14 2-3 |
| Aug. 28, New York | 140,000‡ | 5814 | 2935§ | 1 in 24½ | 1 to 2 | 1 in 47 |
| Sept. 13, Philadelphia | 160,000‖ | 2314 | 935 | 1 in 70 | 1 in 2½ | 1 in 173 |

From this table, though it is not pretended to be perfectly accurate, as the estimate of the population of New York, cannot be more than an approximation, yet it is apparent, making every allowance for error, that in Philadelphia the epidemic influence had its force diminished, and its activity circumscribed.

The epidemic was not confined to any one part of the city, but was extended to every portion. In this respect it contrasts strongly with yellow fever, which has in every period of its prevalence been limited to the Delaware front of the city, the central and western part remaining exempt from the disease. Though cholera was generally diffused, yet it was more prevalent in some districts than in others. The difference appeared to depend on the character of the population.

The following table exhibits the cases returned to the Board of Health, arranged as to districts, with the ratio to the population.

| | Population. | Cases. | Ratio of cases to population. |
|---|---|---|---|
| City - - - - - - | 80,458 | 407 | 1 in 197 2-8 |
| Kensington - - - - - | 13,320 | 111 | 1 in 120 |
| Northern Liberties - - - | 28,932 | 144 | 1 in 200 11-12 |
| Penn Township - - - - | 11,141 | 55 | 1 in 202 3-7 |
| Southwark - - - - - | 20,740 | 251 | 1 in 82 9-28 |
| Moyamensing - - - - - | 6,822 | 198 | 1 in 34 5-11 |

The ratio of cases to the city population appears more unfavourable in the returns to the board than it was in reality. All the cases in the Alms-house, and in the Arch street Prison, which are located in the city, were given to the city, though the inmates of those establishments belong to all of the districts.

The unfavourable ratio for Southwark and Moyamensing is attributable to the character of a portion of their population, and not to the existence of any local causes. In part of Southwark and in Moyamensing, especially in their narrow lanes and alleys, reside some of the worst of our population as to habits of life; and in Moyamensing exists a large black population, who suffered severely from the epidemic.

---

* Permanent population, 27,000; Transient population, 5,000.—Total, 32,000.

† Permanent population, 25,000; Transient population, 3,000.—Total, 28,000.

‡ Estimated as remaining by Mr. Leslie.—*Journal of Commerce, August 8th.*

§ Report of the Inspector.

‖ Population within the bills of mortality.

The coloured class, in comparison to numbers, was attacked by the epidemic in larger proportion than the white class. The following table exhibits this fact.

| COLOURED CLASS. | | | | WHITE CLASS. | |
|---|---|---|---|---|---|
| Cases. | Ratio of Blacks to White population. | Ratio of cases of Blacks to whole number of cases. | Ratio of cases of Blacks to coloured population. | Cases. | Ratio of cases to White population. |
| 338 | 1 to 11 4-7 | 1 to 6 | 1 to 41 | 1977 | 1 to 74 |

The number of deaths from the commencement of the epidemic to the 1st of September by the weekly reports of interments was 909.

The following table presents the deaths from cholera, arranged according to periods of life and the ratio to each period.

| Ages. | Number of Deaths. | Ratio of Deaths to whole Population of that age. |
|---|---|---|
| Under 1 year | 4 | 1 in 604 |
| Between 1 and 2 years | 4 | 1 503 |
| 2 5 | 30 | 1 912 |
| 5 10 | 39 | 1 919 |
| 10 15 | 19 | 1 188 |
| 15 20 | 22 | 1 96 |
| 20 30 | 179 | 1 81 |
| 30 40 | 228 | 1 60 |
| 40 50 | 159 | 1 46 |
| 50 60 | 100 | 1 28 |
| 60 70 | 71 | 1 102 |
| 70 80 | 47 | 1 212 |
| 80 90 | 5 | 1 36 |
| 90 100 | 1 | |
| 100 110 | 1 | |

The results of this table show that the earlier periods of life enjoy the greatest exemption from the attacks of the epidemic, especially the periods from two to ten years. The period of life most liable to attack is from fifty to sixty.

In relation to sexes the deaths presented the following ratio:—

| | Males. | Females. |
|---|---|---|
| | 539 | 370 |
| Under twenty years | 70 | 48 |

During the prevalence of the epidemic an augmentation of other diseases took place, with an increase of their mortality. The diseases which appeared to be thus influenced by the epidemic were those congeneric in character to the cholera, such as inflammatory diseases generally, gastric and enteritic disorders, gastro-enteritic fevers, inflammations of abdominal viscera. Scarlet fever, which has been prevailing for the last three years, acquired a new intensity during the cholera period. This last fact is an evidence, that during the height of an epidemic, other diseases will prevail, undiminished in force. The following table, arranged by Dr. Emerson, from the records of the Board of Health, and who has permitted me to avail myself of it, illustrates the preceding positions.

| DISEASES. | 1831. | | | | 1832. | | | |
|---|---|---|---|---|---|---|---|---|
| | June. | July. | Aug. | Totals. | June. | July. | Aug. | Totals. |
| Consumption - - - | 35 | 41 | 33 | 109 | 44 | 52 | 73 | 169 |
| Convulsions - - - | 18 | 26 | 29 | 73 | 28 | 29 | 33 | 90 |
| Cholera infantum - | 45 | 132 | 82 | 259 | 25 | 134 | 157 | 316 |
| Diarrhœa and dysentery | 18 | 28 | 49 | 95 | 15 | 47 | 83 | 145 |
| Fevers - - - - - - | 17 | 24 | 35 | 76 | 31 | 35 | 55 | 131 |
| Scarlet fever - - - | 5 | 9 | 10 | 24 | 23 | 17 | 14 | 54 |
| Inflammations in general | 32 | 19 | 26 | 77 | 28 | 43 | 29 | 100 |
| Inflam's in the chest - | 16 | 10 | 8 | 34 | 16 | 15 | 7 | 38 |
| Inflam's in the abdomen | 16 | 9 | 18 | 43 | 12 | 28 | 22 | 62 |
| Dropsy in the head - | 22 | 22 | 29 | 73 | 5 | 33 | 23 | 61 |
| do. in the chest - | 2 | 4 | 6 | 12 | 2 | 4 | 3 | 9 |
| do. in general - | 6 | 12 | 19 | 29 | 3 | 10 | 9 | 22 |
| Debility and decay - | 28 | 33 | 29 | 90 | 16 | 45 | 28 | 89 |
| Apoplexy - - - - | 9 | 8 | 4 | 21 | 4 | 8 | 7 | 19 |
| All diseases, (still-born deducted) - - - | 294 | 467 | 490 | 1251 | 369 | 785 | 1431 | 2585 |
| All diseases, (malignant cholera deducted) | 294 | 467 | 490 | 1251 | 369 | 689 | 618 | 1676 |
| Excess in mortality of 1832 - - - - - | | | | | 75 | 318 | 941 | 1334 |
| Excess after deducting mortality from cholera - - - | | | | | 75 | 222 | 128 | 425 |

The following table exhibits the cases and deaths with the ratio, as occurring in private practice and the public institutions, as reported to the Board of Health.

| | Cases. | | Deaths. | | Ratio of deaths to cases. |
|---|---|---|---|---|---|
| Private practice - | 1175 | - | 270 | - - | 1 to 4 3-16 |
| Hospitals - - | 874 | - | 342 | - - | 1 to 2 5-9 |
| Alms-House - - | 174 | - | 92 | - - | 1 to 1 41-46 |
| Arch street prison - | 86 | - | 46 | - - | 1 to 1 20-23 |

The cases reported in private practice are much below the number that actually occurred. The larger number of practitioners in respectable practice, reported those cases only that assumed the worst aspect of the disease, and others those only that proved fatal. Had the whole number of cases that might very properly have been regarded as cholera been reported, the proportion of deaths to cases in private practice, would have been as 1 to 70 or 80, or even more.

After these preliminary statistical details of interest in the general history of cholera, I proceed to the consideration of the particular facts of the disease.

Before and at the period of the invasion of the disease, affections of the stomach and bowels were unusually prevalent. A general state of irritability existed in the alimentary canal, which rendered it liable to be disordered from slight causes that at other times would scarcely have been felt. This condition continued to increase, and during the last weeks of July and beginning of August, there were few persons in the city who were not complaining of feeling unwell from affections of this kind. It was not uncommon also for individuals to be affected at the same time with cramps in the lower extremities, or a feeling of tension, soreness and fatigue in the calves of the legs. It is hardly exaggeration to assert that in this period from fifty to sixty thousand people experienced this species of light disorder. This state of the animal economy was undoubtedly induced by the epidemic principle, acting on the whole community, and is an evidence of its existence, and the universality of its prevalence.

The causes productive of malignant cholera may be divided into predisposing and exciting. The predisposing are of two kinds, specific and common. The specific predisposing cause is the epidemic principle. The existence of this is known only from its effects—like all other specific predisposing causes of disease, its nature, origin, and characters, are unknown. We possess no means of bringing them within the action of our senses, and until that be done we can obtain no positive knowledge of them. We must be content with the inference that such a principle exists, as there is no other mode of accounting for the peculiar phenomena. It is this principle which gives origin to the disease as an epidemic. Acting over a large space and subjecting all the community at one time to its influence, the disease suddenly appears, rapidly progresses in society, numerous individuals being affected in a similar manner, with the same phenomena, and thus gives rise to the epidemic.

From the universal fact, that during the prevalence of epidemic cholera, nearly the whole community are suffering from disorder of the gastric and intestinal organs, it is a fair deduction, that the epidemic principle bears a specific relation to the alimentary mucous surface, acting on it in a manner to place it in an unnatural condition, and impairing the important functions it executes. If we examine what that condition is, the phenomena appear to consist in an excess of irritability. These phenomena are, a furred tongue and pasty mouth; that is, the mucous secretions of the surface of the tongue and mouth are vitiated. The appetite is lessened or destroyed; the digestive power of the stomach is enfeebled; after eating there is a sense of weight, distention or other uneasiness in the stomach; the abdomen feels tight, uncomfortable, often painful; and the bowels are frequently disordered, the evacuations been preceded sometimes with pain, and accompanied with slight tenesmus; or being fluid and unattended with uneasy sensations. Now, all these phenomena are indicative of derangement in the vital activity of the gastro-intestinal mucous membrane, disturbing its normal state of being by its excess of vital force or increased activity. They are the symptoms constantly induced by those agents when taken into the stomach, whose known mode of action is to excite irritations in the vital tissues to which they are applied. From this cause is then imparted an undue susceptibility to impressions, a too great degree of vital reaction, and consequently disorder of the functions of digestion, of chylification, of fecation, and a vitiation of the secretions of this extensive surface, and the muciparous glands that enter into its structure.

Such is the induction, and it is intended as no more, that I would make, from the only primary phenomena we can detect, as to the kind of influence exerted on the animal organism by the unknown epidemic specific principle, giving origin to epidemic malignant cholera. If there be any other influence it is not appreciable, and any consideration of it would enter into the learned category of *speculative data*, and as such is not within the scope of our present design.

The *common predisposing causes* are an enfeebled constitution and imperfect health, especially as connected with derangement of the digestive and alimentary organs, and more particularly originating in habits of intemperance, or from an innutritious and impoverished diet.

To these circumstances are to be attributed the greater proportion of cases amongst the aged, the labouring poor, the wretched, those broken down with toil and bad diet, or who have ruined their health by the grossness of dissipation.

According to the table of deaths to the periods of life, the periods when most perish from cholera are from fifty to ninety years—particularly the periods from fifty to sixty. Now this last period, is that at which feeble constitutions approach their term of duration, and when originally good constitutions, destroyed by irregular habits, have reached a premature senescence, and early succumb to any severe attack of disease.

In the animal economy the various organs which compose its complex mechanism, balance each other as to their forces of life and their supplies of the vital nutritive element essential to the natural state of being and vital reäction of each. In a good constitution the natural balance exists perfect—the individual enjoys robust health. In this state each healthy organ, endowed with all its forces, offers a proportionate resistance to the departure of any other organ from its natural order; it refuses all diminution of its original sum of vitality, and an abstraction of its just proportion of vital fluid. But, as in all diseases of augmented action in any one organ, this state of increased vital reäction can be maintained only by an increased sum of vital force and augmented proportion of vital nutritive fluid, which can be obtained alone at the expense of the other organs, their resistance to this demand, always proportioned to their actual force, is protective against those impressions of an aggressive character excitative of disease in any one organ or apparatus of organs. It is in this manner that general force or tone of the organism protects, to so great an extent, against the local disturbances of particular organs, which is the commencement of nearly all diseases.

On the contrary, when the organism is enfeebled, or general debility is induced by any of those causes which deteriorate the functions whose healthful exercise is connected with nutrition and the maintenance of the vital activity, impressions on any one organ exert their full force. The vital reäction they excite, possesses so much more power than that which belongs to the other organs or tissues, as to overcome its resistance The organ on which the morbid impression is exerted becomes a point towards which are directed, and on which are concentrated the vital forces, and the circulating nutritive fluid, which are thus abstracted from and diminished in the rest of the organism, in a degree corresponding to the extent and importance of the surface and organ affected, and the intensity of the pathological reäction excited.

In a state of health, and in a sound constitution, a just equilibrium prevails in the distribution of the vital forces and the circulating nutritive fluid amongst the various tissues and different organs which constitute the animal organism, proportioned to the nature of the structure, the activity and importance of the functions of each.

The vital forces and the circulating nutritive fluid, are the only moveable elements of the organism that can be influenced immediately by the agents capable of acting on the tissues and organs, producing prompt and almost instantaneous modifications or changes in them. The solid elements of the organs are affected, and exhibit *sensible* modifications or changes only after a considerable period. These changes of the solid materials of the tissues and organs can result alone through the process of nutrition, which is a slow and gradual process. We are not to look for the evidences of a morbid state in the solids in the commencement of diseases, and more especially of acute diseases: they can be manifested alone by the fluid elements of the tissues, and in the activity of the vital and functional phenomena. Now, the phenomena the most generally recognised, if not the exclusive phenomena of disease in its inception and acute periods, are the destruction of the equilibrium constituting the natural or healthy mode of existence, of the vital forces, and vital nutritive fluid, as distributed throughout the organism—and the recuperative efforts of the economy for its restoration. Other effects follow in the train of these, and enter necessarily into the history of disease and of its characters, but *they* are the first link in the chain of pathological sequences, and the most important to seize on, and duly to appreciate.

The ancients, not without some foundation, regarded the animal organism as a microcosm or epitome of the world. The organs are truly so many independent powers, but so connected for their mutual support that none can exist without the aid of the more important, or enjoy a perfect state without the concurrence of even those of least consequence. Each possesses its peculiar organization or constitution, its specific forces, properties, relations and functions; and for the preservation of the whole economy in the enjoyment of a healthful condition, a balance of power is not less essential than it is in the republic of nations for the maintenance of rational independence and public liberty.

Neither of the aforementioned predisposing causes alone are capable of producing cholera, but where the two meet in the same individual, they are adequate without any particular exciting cause to develope the disease. These instances are not, however, common.

The specific predisposing cause, or epidemic principle, is essential to the production of cholera; the common predisposing cause or debility is only an accessary. It imparts a liability to cholera only as it bestows a susceptibility to the attack of any other disease.

From these views of the predisposing causes of cholera is derived a first rule of prophylactics or method of prevention; which is, to carry the nutrition and development of the forces of the different organs to the highest point within the physiological range—or the imparting of general tone, vigour and animation to the whole economy.

This rule is rendered effective by the adoption of a tonic and roborant regimen, consisting of the most nutritious and easily digested aliment, taken in quantities not sufficient to oppress or disturb the operations of the stomach. The fermented liquors perfectly ripe, if individuals could be induced to use them in great moderation, and the sound and tonic wines, as port or sherry, would conduce greatly to the same end.

The *exciting causes* of the disease are various and numerous. In fact, whatever is capable of producing a powerful impression on the economy, or occasions disturbance in any of its important functions, more particularly of the digestive apparatus, whether it be of a physical or moral nature, may become an exciting cause of malignant cholera, in an individual whose system is predisposed to the disease, from being under the influence of the epidemic principle.

The most common of the exciting causes are, however, such as act directly on the alimentary canal. All kinds of aliment difficult to digest, which resist the action of the stomach, which pass unchanged in their characters into the intestinal tube, by the disorder they create in the stomach and bowels, are the most usual of the exciting causes of the disease. Of this character are crude vegetable food, unripe fruits, or in those of bad digestion, any kind of fruit. Vegetable food is always more difficult to digest than animal food; and in individuals whose digestive functions are impaired, vegetable food of a crude character invariably is productive of great inconvenience, of painful and distressing feelings, and sometimes of violent disturbance of the stomach and alimentary canal. Now, during the prevalence of epidemic malignant cholera, almost every one is suffering in the functions of the digestive organs. The whole community nearly are, for a time, dyspeptic, and the same precautions are required, both as regards the quality and the quantity of food, as in patients labouring under that disease. It is this change wrought in the state of the digestive apparatus, and the enfeeblement of the digestive functions, rendered incapable of assimilating vegetable food, and no alteration in the nature of the food itself, that causes vegetables suddenly to become so frequently productive of disordered states of the stomach and bowels during the epidemic period, and so common an exciter of the disease.

Although crude vegetable aliment is preëminent as an exciting cause of the disease, yet its attacks may likewise be induced by animal food, when eaten to excess, or its quality is defective. To speak with great precision, it is not the food that is the exciter of the disease, but the indigestion which ensues when food is taken either as to quality or quantity incompatible with the state and forces of the stomach. Vegetable more frequently is at variance with the digestive forces than animal food; but when animal food, from its quantity will cause an indigestion, or it be of a quality that produces the same result, and of this character are pork, smoked and dried beef, clams crabs, lobsters, &c. then an attack of cholera will be invited, equally as by vegetables.

Liquid aliment exerts no small share of influence on the production of the disease. All acid drinks, particularly cider, thin, sour wines, bad water, very cold water, ices, new beer, porter or ale, by deranging the stomach and bowels, are causes of attacks. The dry, tonic and astringent wine, old, strong, well-fermented malt liquors, a *little brandy* in water, at dinner, if individuals will limit themselves to a small quantity, by invigorating digestion, are prophylactic or preventive of the disease.

All general rules must have exceptions. The *golden rule* is, that whatever agrees with the stomach of any individual, digests with facility, or promotes digestion, is to him the best, and is so far protective; and whatever resists his digestive power, or disturbs his alimentary functions, that is injurious, and exposes him to be attacked by the epidemic.

Moral emotions have been observed in repeated instances to prove exciting causes of the disease. They are all, however, such as are known to have a concentrating influence, imparting a movement of the circulation from the exterior to the interior surfaces, and to derange very seriously the gastric and intestinal functions. The moral exciting causes of malignant cholera, have been fear, grief, and despair, awakened by the sudden and destroying blight withering the bright prospects of life from the loss of relatives, connexions, and friends. The excitation of these passions has often presented the most desolating scenes. Numerous members of a family, united by the tenderest ties, have, in the rapid succession of a few hours, been consigned to the grave. The disease, called into existence by those causes, assumes an intensity of character, and acts with an energy of destruction that baffles all attempts to arrest its progress.

Of the other exciting causes, it is proper to enumerate and to point out unwholesome effluvia, and exhalations of all kinds, capable of affecting the animal economy, and are known especially to disorder the stomach and bowels. The putrid emanations escaping from animal and vegetable matters in decomposition belong to this category. Hence arises the necessity of the most complete attention to cleanliness in cities; to the exertions of an active police, preventing the accumulation of offals either in the streets, lanes, private alleys, and the premises of individuals; and the immediate removal and destruction of similar offensive substances. A strict supervision is also required over warehouses, where are stored hides, provisions, grain, and vegetables in bulk, in order to prevent the mischief that frequently arises from this source.

The vitiation of the atmosphere from crowding in a small space a large number of individuals, has been another prolific exciting cause of malignant epidemic cholera. It is a well-recognised fact, that every individual vitiates, by the process of respiration and the exhalations from his body, a certain quantity of atmospheric air. For healthful existence, for the due exercise of the animal functions, a necessity is thus created, that each individual should be surrounded by a certain space of air constantly renewed. When this most salutary provision is neglected, and too many persons are brought together and live in confined apartments, their health is impaired, their organism is deteriorated in its structure, their functions are disordered in their performances, and their vital forces are degraded. In such situations, whenever epidemics prevail, those who inhabit them are the most severe sufferers, and furnish the greatest number of victims to the destroyer. Dwellings in narrow courts and in lanes, crowded with inhabitants, are the chosen seats of pestilence in all cities. The Bellevue Alms-house in New York, the Arch street Prison and Alms-house of this city, are noted and striking instances of the deleterious influence on the constitution, flowing from this cause, and its coädjuvancy in calling into existence the pestilence in its most malignant and direful aspect.

Marsh exhalations—malaria, the common causes, at other periods, of intermittent, remittents, and of dysentery, are exciting causes of malignant cholera during the epidemic period. The economy acted on by the epidemic principle, and already disordered in its functions, is predisposed to assume the *type* of cholera, under any perturbating or disturbing operation. The malaria poison, in this condition, brought to display its energy on the organism, developes, instead of its more usual effects, cholera, which is on the point of exploding, and requiring only an unusual disturbing impression deranging the harmony of the organs and the balance of their forces, for its production. From this circumstance it is, that the situations often the first to suffer from cholera, and to experience its worst ravages, are those the most subject to be affected with the various gastric and intestinal diseases, the fall fevers, originating from malaria. We possess in this fact also the explanation of the apparent affinity of epidemic cholera for streams and water-courses. They are the especial seats of malaria; the banks of rivers and creeks have ever been noted for their unhealthiness, for the production of fevers and dysenteries; and it is the localities where those diseases are commonly most rife, that next to large cities, cholera is the most early displayed, and the most severe in its devastations.

Canal diggers, graders of rail-roads, canal and river boatmen, exposed by their employments to the noxious malaria, suffer terribly from fevers having this origin. Along our canal lines, the work has frequently been suspended in the autumnal months, from the havoc amongst the labourers proceeding from febrile diseases. This class presented the first victims of the disease in New Jersey, and in portions of the interior of this state were the principal, if not exclusive sufferers. I am informed by Dr. MIFFLIN, who was engaged by the Schuylkill Canal Company to attend on the workmen and boatmen on the Schuylkill, that in the middle of September the disease broke out amongst the Irish labourers employed in the rail-road on the top of Broad Mountain, seventeen hundred feet above the level of the sea. This location is several miles distant from the main road, and in a country destitute of inhabitants. The turning up of the virgin soil, which has remained undisturbed for centuries, in the summer season or autumnal months, the period generating terrestial exhalations, in this country, it is well known, is productive of fevers often of malignant character. To this cause, as immediately exciting the disease, is to be attributed the cholera in this gang of labourers in so elevated a region.

Other exciting causes of the disease might be enumerated, but, as they are less common than the preceding, and somewhat accidental in occurrence, it is not requisite to notice them.

A knowledge of the predisposing and exciting causes of the disease, will enable us to understand many circumstances that have been regarded as almost inexplicable anomalies in its history, progress and development.

The specific remote cause of epidemic malignant cholera—the epidemic principle—appears to approach a district of country gradually, augmenting in intensity, acquiring its acmé of force, and then slowly declining, passes away. The epidemic is usually preceded by affections of an analogous or congenerous nature to itself, and its close is characterized by similar diseases, in both periods evidently the product of the epidemic principle in a light form. When it has reached a certain power the epidemic commences, and it explodes first in those positions where are congregated the subjects of the disease in greatest numbers, and where the exciting causes of the disease are the most active and most numerous. Bodies of troops in active service, exposed to the hardships of a campaign, are, from these causes, the first often to feel the effects of the epidemic. The suburbs of large cities, in which always are collected the most wretched, destitute, and abandoned portion of the population of a country, are generally the first amongst locations where the epidemic commences its ravages. The towns and villages on the banks of rivers and water-courses, are the next to suffer, and in this respect great diversities are observed, explicable by keeping in view the exciting causes of the disease. The situations the most unhealthful, that are low, damp, surrounded by marshes, or where exhalations and malaria are produced by any local circumstances, will be invaded by the disease, while those that are elevated, dry, and possess a pure atmosphere, escape. Situations thus differently characterized will often be in the vicinity of each other. The one will be devastated by epidemic cholera; the other will be exempt, or the inhabitants at most suffer from that light state of the disease termed cholerine.

A body of troops in good health have encamped on the banks of a stream, in the vicinity of a jungle or other position whence arose pestiferous exhalations. Very soon cases of cholera were manifested, and of malignant character, rapidly succeeding each other. The encampment was removed a short distance to a more salubrious site and purer atmosphere. The disease has immediately ceased. In those instances the circumstances of the locality are explanatory of the facts. The malaria acts as an exciting cause on subjects predisposed by the pervading influence of the epidemic principle to assume a specific form of disease. Without this predisposing cause, simple fevers or the common jungle fevers would have been the form of disease developed by the miasmatic poison. The change of position, by withdrawing from the operation of the exciting cause, terminated the disease, leaving merely the predisposition to its attacks common to every one in the same district, and liable to similar attacks whenever an exciting cause of sufficient activity and energy are brought to act on their systems.

From this examination of the causes of cholera, I now proceed to the investigation of its *pathology*, or the modifications of the forces, actions, structure and functions of the organ constituting the disease.

In determining the pathology of disease two guides are to be followed; 1, the symptoms or phenomena prevailing during life which make known the existence of disease; 2, the alterations of structure detected by autopsy after death. Each of these possesses its peculiar advantages; neither, exclusively, can be implicitly relied on.

Symptoms, which are the external signs or manifestations of disease, arise from the disordered functions of the organs or tissues affected. Similar symptoms attend on opposite conditions of the same organs. To understand their real meanings, the physician who observes and studies them, must be thoroughly proficient in the knowledge of the structure and functions of the organs, their relations and dependencies. If he be wanting in this information he cannot understand them. They are only known when they can be correctly translated into anatomico-physiological language, expressive of the mode of the structure, the functions, and vital reäction of the organ. When this cannot be done we may be assured, the knowledge assumed is conjectural, and the practice founded on it must be empirical.

The alterations of structure ascertained by instructed observation, accurate and minute, is of great value. It fixes the location of disease and points out the source of the symptoms that existed. Too much, however, is claimed for pathological anatomy. The structural alterations are not the disease. They are the consequences only, and must no more be confounded with the disease, than the alterations of the secretions are to be regarded in the light of disease. Softening, thickening, hardening, ulceration, hypertrophy and other unnatural modifications of the tissues, are no more disease, than is pus disease, or lateritious urine, or the bile and mucus ejected from the stomach or bowels are disease. They are all consequences, they are effects, modifications of the physiological phenomena in which consist the organic circulation, nutrition and secretion.

Pathological anatomy furnishes data from which the pathologist may commence, guided by physiological principles, observation and experiment in order to arrive, by the means of a strict induction, to a knowledge of the essential characters of the disease. This is the extent of the benefits it promises to our science. In many cases it necessarily fails entirely, or nearly so, in elucidating either the seat or the character of disease. When death supervenes rapidly in the space of a few hours in acute and violent affections, alterations of structure cannot be detected. To their production time is required. Tissues cannot soften, harden, thicken, ulcerate, become hypertrophied, atrophied, or converted into an anormal organization except by the slow process of modified nutrition. In vain will a LOUIS, ANDRAL, or CRUVEILHIER seek with their scalpels to reveal the seat, or extent, or the nature of the vital modification, that had existed during life, had caused the destruction of the patient, and been obliterated in and by the very act of dying.

In pathological investigations both methods are to be employed—the anatomical, to determine the location of the lesion, the period of structural alteration induced—the physiological for the explanation of the symptoms, and the elucidation of the modification of the vital reäction, giving origin to the symptoms or disordered function, and the morbid structural derangement.

These remarks have been called forth by the conflicting doctrines on these points embraced by opposite parties. The rigid physiologists with Broussais at their head are too much disposed to underrate pathological anatomy, though Broussais' work on Chronic Phlegmasiæ really gave to this department of science the great vogue it now maintains. Louis, who we suspect possesses a very slight knowledge of physiology, and his followers, regard physiology of little or no importance, and pathological anatomy as alone offering the means of ascertaining the nature of morbid lesions—avoiding an exclusive adhesion to either aid will be invoked from both in the following investigation.

The cholera as it appeared and prevailed in Philadelphia, presented no characters different from those which have been described by so many writers in Asia and Europe. The only symptoms I observed, which have not been noticed, as far as I am informed, by previous writers, was a spontaneous vesication that occurred in two patients in the hospital under my charge, and in one of the out-door patients residing in the vicinity of the hospital. They were all blacks, and the disease fatal. The cuticle was elevated by effused serum, and separated as though caused by the application of a blister. In the first case I was so much impressed with the belief that the effect had been the result of a blister, that I expressed my dissatisfaction of its application to the forehead and face. In most of the patients in my hospital a strong tendency to vesication appeared to exist. Frictions with spt. camphor in repeated instances caused a complete separation of the cuticle. In the commencement of the disease a terebinthinate decoction of cantharides was employed as a rubefacient, but it was very soon laid aside in consequence of the extensive vesication and loss of cuticle that succeeded its employment.

From the close similarity of the disease, to the descriptions so frequently repeated by the numerous authors who have made it the subject of their writings, it is wholly unnecessary for me to reïterate the general catalogue of its symptoms.

The disease presented five different periods or trains of symptoms, each constituting a different condition of the animal economy. These did not occur in every case. On the contrary, there often existed but a single group of symptoms, but one condition or period of the disease. It was arrested here, either by the recuperative operations of the organism, or by the remedial processes of art, and did not pass into another period or stage. In other cases two or three of the periods would occur passing with more or less rapidity from the one to the other; it was rare that the whole of the periods took place; the disease terminating very early in the first, second or third period, by a recovery, or ending fatally in the fourth. In the City Hospital, No. 5, under my charge, there were admitted sixty-nine patients; sixty-two of well-marked cholera in its various stages. Of this number five only exhibited all the periods.

The periods or groups of symptoms manifested in the disease are the following:—first period, of incipient irritation or the premonitory stage; second period, of confirmed irritation or forming stage; third period, of incipient concentration, commencing collapse or algid state; fourth period, of complete concentration, confirmed collapse or perfect algid state; fifth period, of reäction or febrile state.

The following tables will exhibit the proportions of these periods in the cases which came under my immediate charge. In Hospital No. 5, sixty-five cholera patients.

| | |
|---|---|
| First period—incipient irritation, - - - - - - - - | 5 |
| Second period—confirmed irritation, - - - - - - - | 21 |
| Third period—incipient concentration, or collapse, - - - | 14 |
| Fourth period—confirmed concentration, or complete collapse, - | 20 |
| Fifth period—reäction, or febrile state, - - - - - - - | 5 |

In private practice, I attended fifty-five patients, who were so unwell as to require medical treatment at their domicils. Of those who called at my office, affected with the symptoms of the first period in a slight degree, I kept no account.

| | |
|---|---|
| First period, - - - - - - - - - - - | 26 |
| Second period, - - - - - - - - - - - | 23 |
| Third period, - - - - - - - - - - - | 5 |
| Fourth period, - - - - - - - - - - - | 1 |
| Fifth period, - - - - - - - - - - - | 0 |

I attended further in consultation in eight cases, to which I was invited after the treatment was commenced. They stood as follows:—

| | |
|---|---|
| First period, - - - - - - - - - - - | 0 |
| Second period, - - - - - - - - - - - | 2 |
| Third period, - - - - - - - - - - - | 1 |
| Fourth period, - - - - - - - - - - - | 5 |
| Fifth period, - - - - - - - - - - - | 1 |

The above tables exhibit the difference between hospital and private practice, and explain the greater mortality of the first. The patients of the hospitals are from the very lowest portion of society—individuals who are accustomed to neglect light affections, or whose sensibility is so much blunted by their mode of life, their privations, exposure to every kind of hardship, and by incessant labour, as to be scarcely conscious of the first approach of disease. They claim medical assistance only when the advance of disease utterly disables them from attending to their daily employments, confines them to their bed or house, or prevents the supplies of their wants. Hence it is, that in epidemic cholera, when first brought to the hospitals, especially in the commencement of the epidemic, the patient presents the symptoms in their most aggravated shape, and advanced into the last period of the disease.

*First period—incipient irritation.*—The symptoms of this period are often the direct result of the epidemic principle acting on the economy, and disturbing the mode of being or condition of some organs, usually the digestive. They are commonly termed premonitory signs or symptoms. I believe it preferable to designate them in a manner to indicate their nature, or the state of organs on which they depend.

Most commonly the symptoms of this period are developed in consequence of the diet, or some article of food not being in accordance with the actual condition of the digestive apparatus; the natural relation being the forces of the organs, and the aliment being destroyed. In this state the aliment causes the same effects, produces the same kind of disturbance in the digestive apparatus, as results in ordinary circumstances from the presence of foreign matters incapable of assimilation. They occasion an indigestion, or excite in the stomach and in the intestines an irritation analogous often to that of an emetic, or a purgative. If the aliment be not adapted in its quality or quantity to this altered condition of the digestive powers, nausea, vomiting, and purging will be the more frequent consequences. But, by an adaptation of the aliment as to its quality and quantity to the actual condition of the digestive organs and functions, these symptoms do not occur, and the patient merely experiences that slight uneasiness which is characteristic of dyspepsia in its earlier stages. The digestion is embarrassed; a sentiment of plenitude exists in the epigastrium; the belly feels uncomfortable; there are feelings of heat in the abdomen; the tongue is white, is more or less furred; the appetite is lost or irregular, and a tendency to diarrhœa prevails. Such are the general features produced in the first period when the symptoms are not excited or aggravated by imprudence in diet and regimen.

The temperament of the individual, his constitution, and other similar circumstances in all diseases, modify the symptoms. Their influence is particularly apparent in malignant epidemic cholera. In the first period two different trains of symptoms are exhibited depending on the particular temperament and constitution.

In the sanguine temperament the symptoms partake more of the inflammatory character. The pulse is often full, the thirst is urgent, nausea, vomiting and purging are more frequent, and especially if this be conjoined with a bilious or hepatic predominancy; the discharges then frequently contain some bile. Cramps, spasms, and violent pains, are in these subjects light, or do not exist, and are entirely secondary in importance.

In the nervous temperament, the predominant symptoms are of a nervous character. The patient suffers from excruciating spasms of the stomach and bowels, neuralgic pains in the limbs and the body, with cramps of the voluntary muscles, while the disturbances of the digestive and intestinal functions appear of secondary consequence, or are sometimes wholly wanting. Notwithstanding the severity of the nervous symptoms, the primary irritation is fixed on the digestive mucous tissue, and the nervous symptoms are induced, and acquire their intensity from the great activity of the nervous functions connected with the larger development of the nervous structure.

The following cases will illustrate the different forms of the disease in the first period, or group of symptoms modified by the temperament.

Case I. *Temperament sanguine; diarrhœa; pain in abdomen; fainting; pulse full.*

James M‘Neal, aged twenty-four years; a white; stage driver; good habits; ruddy complexion; brown hair. Entered the hospital August 23d, at 1 P. M.

For several days he had been affected with diarrhœa; had headache and pain in the umbilical region. A short time before coming to the hospital he had fainted.

*Present state.*—The diarrhœa continued with pain in his bowels; pulse full and has force; tongue furred and of natural temperature. Dr. Tucker, the hospital physician in attendance, directed v. s. ℥xvi. and cups to the epigastrium; cold gum water and arrow-root for diet, with an opiate. The symptoms were arrested in the course of the day.

*August 25th.*—Discharged well early in the morning; cautioned as to his diet. Returned at 2 P. M. with renewal of the pain in the umbilical region, in consequence of eating indigestible food. Cups were applied to the abdomen with prompt relief. The patient was kept under observation until the 1st of September, and discharged well.

Case II. *Temperament highly nervous; spasms; pain in abdomen and chest; universal cramps; difficult respiration; coldness; feeble pulse; no vomiting or purging.*

Mrs. C. aged twenty-four years; delicate constitution; light complexion; fair skin. Saturday, August 11th, felt general uneasiness and sense of coldness; had head-ache, loss of appetite, and extreme lassitude; kept her bed, but took no medicine. A plaster of mustard and ginger applied to the abdomen caused warmth in the surface, and gave relief to the unpleasant feelings.

*Sunday, 12th.*—Symptoms much increased; feeling of numbness in feet and hands; great oppression in the chest, amounting to orthopnœa. Soon after cramps commenced in the toes, extended to the calves of the legs, and in a short time the whole muscular system was invaded. The fingers and toes were almost constantly contracted. Spasms seized on the muscles of the abdomen, chest, throat, and extremities, while the bowels appeared equally to be affected with spasms. Surface cold; thirst excessive—constantly demanding cold drinks.

The patient was visited by Drs. Elkington and Wiltbank. Blood had been taken from the arm, which had partially relieved the oppression of the chest. Frictions and sinapisms had in some degree allayed the spasms. The symptoms still continuing with severity, I was requested to see the patient in consultation in the evening.

At this time the most distressing symptoms were, great oppression in the region of the heart; pain throughout the chest; respiration irregular and difficult, with frequent cramps of the muscles, and spasmodic pains. The temperature was below the natural standard; the skin pallid; the pulse small and frequent; thirst still intense. The stomach and bowels had not been affected. Cups were directed to be applied to the chest and præcordia; a ʒss. of solut. of morphia; iced carbonated water for drink, with injection of spt. camphor in solut. of carb. soda.

*August, 13th.*—Relief had immediately ensued on the application of the cups. The pains and oppression of the chest, the cramps had disappeared. The pulse was fuller and slower, and the temperature restored. Convalescence immediately ensued.

In the above cases are presented specimens of the first period of the disease as displayed in the sanguine, and in the nervous temperament. In both the symptoms are strongly marked. That the disease had not progressed beyond the first period, appears evident from the rapidity with which the symptoms were subdued. Many similar cases might be adduced, but the two will be sufficient to characterize the classes of cases.

In the first or period of incipient irritation, in immense numbers, the symptoms were much lighter than in the cases cited, and required a much less energetic treatment, or disappeared under the influence of a properly regulated diet. The symptoms in a great number, never proceeded beyond this stage, but continued recurring every day or two, from one to two weeks, causing the person to feel unwell without being positively ill. Those individuals generally possessed good constitutions, enjoyed good health, possessed the comforts of life, were regular in their habits, and attentive to their mode of living.

*Second period—confirmed irritation.*—This period of the disease, was preceded in every case in my private practice by the first. In hospital No. 5, the same fact generally prevailed, though in two or more instances, it was doubtful. But in the class of persons who form the patients of a hospital, it is exceedingly difficult to obtain accurate information. It is requisite for this purpose to renew the inquiries frequently, and to vary the manner of expression. I have often been answered in the affirmative, when I had asked if the bowels had been regular; and immediately afterwards when the question was made direct as to the number of times the privy had been visited, was told ten or twelve times in the course of the morning. Without great caution, errors in this respect will be made. Intemperate persons are very subject to attacks of nausea, vomiting, and diarrhœa, and these symptoms in the first and second periods of the disease, are attributed by them almost universally to their habitual complaints. They take no notice of them, and unless the inquiries are made in a very direct manner, they will not be alluded to by the patient. I have known such patients in the state of collapse to assert that the disease came on without previous symptoms, and when brought to acknowledge they had been affected with diarrhœa or vomiting, to treat it as a matter of no consequence, from being subject to great looseness and sickness of stomach.

The symptoms of this period are most usually called into existence by some of the exciting causes already enumerated. They are the symptoms of the first period exaggerated, augmented in force, from the greater intensity of irritation developed, the extent of the surfaces it occupies, and the excessive predominancy it imparts to the organs in which it is located.

The cases of this period like those of the first, do not present the same symptoms. These are modified by the temperament and constitutional peculiarities of the individual.

In this period vomiting, purging, cramps, and pain in the abdomen are the most prominent symptoms. Of these symptoms purging is more constant than the others. The following table exhibits the proportions of these symptoms, in twenty-one patients.

| | |
|---|---|
| Vomiting in | 13 |
| Diarrhœa in | 20 |
| Cramps in | 10 |
| Pain in abdomen in | 21 |
| Thirst in | 13 |
| Pulse very feeble in | 4 |
| Pulse full and strong in | 9 |

The matters ejected were in the commencement the food last taken, subsequently a thin, clear fluid, mixed with thick, viscid mucus, occasionally whitish flocculi, and sometimes coloured yellow, but more frequently of light grass or verdigris green from bile.

The dejections from the bowels were, in the greater number of cases, a thin whitish fluid, resembling whey, or thicker, having the appearance of oatmeal gruel; sometimes they had a brownish aspect like dirty water; or were tinged with bile.

The urine in this stage was generally diminished, but seldom suppressed.

The temperament gave a decided character to the symptoms. The following cases will illustrate the disease as modified by a highly nervous temperament.

Case III. *Spasms; cramps; violent pain in abdomen.*

Miss J. A. aged twenty; very pallid; subject for many years to violent head-aches with very little intermission, for which she has been frequently depleted, and long kept on a regimen; menstruation regular; was seized August 5th, early in the morning, with excruciating spasms in the stomach and bowels. She had never before experienced a similar attack. Soon after violent cramps affected the whole of the voluntary muscles. Blood was taken from the arm without diminution of the symptoms; laudanum given in large doses; sinapisms to extremities and abdomen; and finally, spt. turpentine and laudanum administered as an enema. The cramps towards evening disappeared, but the pain of abdomen continued with cold surface and extremities.

*August 6th.*—Pain of abdomen continues with occasional spasms, pulse feeble; skin cool; bowels freely opened; thin discharges attended with no pain; fifty leeches to the abdomen; calomel, gr. ii.; opii, gr. i. every four hours.—Evening. Pain much relieved; pulse more developed.

*7th.* Entirely free of pain; no spasms; some soreness of abdomen on pressure. Diet.

*8th.* Convalescent; sitting up.

Case IV. *Pain in abdomen; previous looseness of bowels; violent spasms of stomach and bowels; diminution of temperature; cramps; no vomiting or purging.*

Mr. C. E. aged forty years; tall; thin; pallid complexion; light hair and eyes; nervoso-lymphatic temperament; feeble constitution. From the commencement of the epidemic he had been disturbed in his bowels frequently, and his digestive powers impaired. He had taken advice for these symptoms repeatedly at my office, and been particularly observant of his regimen.

*August 20th.*—I was sent for to visit him at his residence. The uneasiness of his abdomen and disorder of his bowels had been increasing for some days. The day previous, 19th, the looseness had ceased, and the pain in abdomen had augmented. It continued to increase, and this morning had attained the severity of violent spasms. I did not see him until near 4 P. M. At this time there was constant pain in the bowels, accompanied with paroxysmal spasms of stomach and bowels frequently returning. The pulse was feeble and the surface cool. Hot fomentations were directed to the abdomen, and the following mixture prescribed. Spt. lavend. comp., spt. camph. āā. ʒiv.; acet. tinct. opii, liq. Hoff. anod. āā. ʒii.; a tea-spoonful every half hour. 7 P. M. no relief; spasms augmenting; twelve cups directed to the abdomen, and a purgative injection to open the bowels. 10 P. M. symptoms more aggravated; pulse very small and feeble; temperature of surface very much diminished, especially of the extremities; pain of abdomen excessive, and spasms violent. Calomel, gr. iv.; opium, gr. ii. were administered. No abatement ensuing in the severity of the spasms; sixty drops of laudanum were given. The surface was rubbed with Cayenne pepper and alcohol; sinapisms applied to the abdomen and extremities. 11½, same state. I now directed water nearly boiling to be taken as rapidly as it could be swallowed. Three tumblers of it were sipped with a tea-spoon in about ten minutes. The spasms of the stomach immediately ceased and did not again return. The pulse became developed; the skin warm, and a perspiration broke out. An injection consisting of fifty drops of spt. terebinth, and sixty of laudanum, with a tea-spoonful of mucilage was thrown into the rectum, and I left my patient at 12½ o'clock relieved of the urgent symptoms.

*August 21st.*—Had slept during latter part of night; no return of spasms; abdomen feels sore; skin warm; pulse full and round; uneasy feelings in the bowels. Directed chicken water, and castor oil, ℥ij.—Evening. Bowels open.

*22d.*—Pain still felt in bowels; motion causes feeling of soreness in abdomen; looseness of bowels returning; discharges copious; calomel, gr. i.; opii, gr. i.; twice per diem.

*23d.*—Uneasy feeling in bowels; tendency to diarrhœa; diet, rice; occasional opiates.

Convalescence was slow, and it was not until the 28th, the symptoms of diarrhœa and uneasiness of the bowels had disappeared.

*Remarks.*—In the above cases the nervous temperament of the individuals bestowing a strong predisposition to disturbance of the nervous functions, gave origin to the intense spasms and neuralgic pains, which characterized them, and became the master symptoms of the disease. These cases are merely exemplars of a number perfectly similar, that fell under my observation about the same period. That they were genuine choleric cases, that is, excited by the epidemic choleric principle, I entertain no question. We have the fullest evidence that this principle developes an active and extended irritation of the alimentary nervous tissue, and constant experience proves to us that in the highly nervous temperament, an irritation of that tissue will so affect the nervous organs, as to occasion cramps, spasms, convulsions, apoplexy and other diseases of the nervous apparatus. The following case exhibits a singular form of spasmodic disease, originating in this manner and illustrates the principle.

Tenth July last, at 8 o'clock in the evening, I was requested to render assistance to an Irishman employed as an ostler, at a livery stable. I found him with three persons engaged in holding and rubbing his left arm, while he was writhing with pain, which extorted from him violent vociferations. The muscles of the arm from the shoulder down were intensely cramped, but no others of the body were affected. The cramps returned at intervals of four or five minutes. The pulse was full, strong, and bounding; the face flushed; the skin warm and covered with perspiration; great thirst. When asked if he suffered any other pain than that from the cramps in the arm, he answered negatively. Yet the slightest pressure on the epigastrium elicited loud exclamations. His statement was, that he had been previously in good health, and that he had dined heartily on fried bacon. After dinner while occupied in washing a carriage, he felt cramps in his wrists; these continued to increase until they acquired the force in which they then existed. Thirty ounces of blood were taken from the arm, cold sweetened water given to drink, and a purgative injection administered. The cramps ceased soon after the abstraction of the blood, and did not return. In this instance indigestible and stimulant food eaten to excess, had awakened gastric irritation, which radiated into the nervous apparatus, had excited those centres or spinal ganglia pathologically which transmit nervous stimulation to the muscles of the left arm. Hence the spasm of those muscles.

In the year 1826, I published in the North American Medical and Surgical Journal, several cases illustrating this fact of gastric irritation exciting nervous phenomena in those endowed with the nervous temperament. These cases at the time were regarded as conclusive on this point by several of the European Journals, into which they were transferred. I have since then witnessed many cases of the same character. As this is a point of no inconsiderable importance, and illustrates an important pathological fact, the following additional case may not be considered as irrelative or inappropriate.

*May* 15*th*, 1831.—Was requested by Dr. S. of this city to see his infant, aged four months. It had been for the last forty-eight hours affected with a catarrhal fever. It had been purged, and was taking vin. antimon. in small doses every hour. This morning was seized with spasms; the arms were fixed and muscles rigid; the head and body drawn backwards; no tendency to coma or stupor; the eyes kept in a fixed stare; incessant, short, loud screams were uttered, totally different from crying, and indicative of severe agony; countenance expressive of suffering; the head was cool; tongue red, covered with white fur; belly hot. Regarding the case as one of gastric irritation, attended with the agony of thirst, which these little ones are incapable of making known, and the irritation radiated into the nervous system, I called for some sweetened cold water. It was swallowed most greedily. The screaming ceased in ten minutes; the stiffened limbs were relaxed; the little sufferer began to take notice, and in a short time fell asleep. The next day it was perfectly well.

In this case the spasms and nervous affections unequivocally were produced by the gastric irritation, and yielded instantly to the calming action of the only real direct sedative we possess—cold—applied immediately to the seat of primitive irritation.

I could cite many similar cases, occurring especially in children, of intense spasms, almost immediately relieved by cold drinks: annually I witness some six, eight, or ten cases of the kind.

In the *sanguine temperament* the nervous symptoms are either feeble, or do not exist; while inflammatory symptoms are those that take the precedence. The following cases exhibit the characters of the second period, or confirmed irritation in the sanguine temperament.

Case V. *August 17th.*—While making a visit to one of the family of Mr. F. late in the evening, I was informed the servant girl had just been attacked, and was requested to see her. Nearly the whole of this family had been affected in various degrees with the disease, and Mr. F.'s mother, an aged lady, had died with it a few days previous.

The patient was a girl aged twenty; strong and active; sanguine temperament. She had been labouring under diarrhœa the previous day and during this day, but had not discontinued her employments, and had exposed herself to cold by working in bare feet.

The diarrhœa had suddenly been checked; violent pains in the bowels had ensued; she was bent double, and could not hold herself erect. The pulse was full; skin warm; feet cold; no cramps; v. s. to ℥xxiv. was practised; a hot fomentation applied to the abdomen, and hot stimulant foot-baths directed; to be followed by an enema of flaxseed, mucilage, and laudanum. The relief was prompt.

*18th.*—No return of violent pain in bowels; abdomen sore; head-ache; bowels not opened.—Evening. Augmentation of symptoms; pain in bowels augmented; face flushed; sickness of stomach; head-ache; the abdomen was covered with cups, and an emollient injection thrown into the bowels.

*19th.*—Much improved; bowels free; slight febrile movement and head-ache. Rice water for diet.

*20th.*—No return of symptoms.

Case VI. *Cholera, second period; confirmed irritation, and tendency to collapse.—Diarrhœa; pain in bowels; pulse feeble; temperature relieved; cold and clammy extremities; reäction; sanguine temperament; plethoric habit.*

*August 11th.*—Was called to visit Mr. T. H. at 8 P. M. Patient aged sixty-two; stout; robust; powerful frame; constitution excellent; light eyes and hair; florid complexion; temperament sanguine; this is the first illness for many years.

For several days had been complaining of loss of appetite, uncomfortable feelings in the bowels, with slight looseness. Had no desire to eat at dinner to-day, but from habit sat down to table and eat roast beef. Soon after dinner was attacked with diarrhœa; dejections very copious and exhausting. To use his own expression, he felt as thoug his whole body was coming through his bowels. At the time of my visit he was suffering severe pain in the bowels; the abdomen painful on pressure; the temperature reduced below the natural standard; the feet very cold and cramped; hands and wrists cold, and covered with moisture; the pulse feeble, and quite small. The face pallid, haggard and shrunken; the voice husky as from a cold; urine suppressed; thirst.

An enema of tinct. thebaic, gtt. lx. in starch was directed. Dry warmth to the lower extremities; eighty leeches to the abdomen, and tinct. thebaic, gtt. x., spt. camphor, gtt. v. every hour; after the leeching warm fomentations to the abdomen.

11 P. M. the pain of the abdomen and bowels had subsided immediately after the leeching; reäction commencing, the pulse fuller and stronger, the skin has a more comfortable feeling.

*12th.*—Reäction complete; about 2 A. M. the pain had entirely ceased in the bowels; abdomen feels sore and tender; diarrhœa checked; skin warm; face has recovered its natural expression, colour and fulness; pulse is large and full; thirst is very great; rice water and carbonated water for drink.

5 P. M. continues in same favourable state; febrile movement moderate; has passed no urine; thirst unabated; prefers carbonated water for drink.

*13th.*—Return of pain in the bowels; no urine passed; fever very slight.—℞. Mass. hydrarg. gr. viii.; opii. ipecac. āā. gr. ii. divid. in pill. iv.; one every three or four hours. Flaxseed tea and spt. nitri dulc. for drink.

5 P. M. Pain relieved; no urine; no stool to-day.

*14th.*—Passed a good night; urinates freely this morning; thirst abated; skin natural; pulse soft and slower.

In this case, as in some others I met with, costiveness ensued, and it required considerable attention to diet in order to restore the regular operations of the bowels. They were brought on in this instance by drinking for some time Saratoga water.

*Remarks.*—In this case there was a total absence nearly of all nervous phenomena. The evidences of simple sanguine irritation of the gastro-intestinal mucous tissue, mounting rapidly into inflammation, were the only decidedly appreciable signs existing. The sudden exhaustion that had ensued so rapidly from the time of the attack, in an individual enjoying what might be termed rude health, and possessed of great vigour of constitution, deterred me from the employment of general depletion. When the danger of collapse is imminent, as in this case, general depletion is a doubtful, and often a hazardous remedy. Should it have the effect of diminishing the irritation of the gastro-intestinal mucous tissue, without impairing to a great degree the forces of the other organs, diffusion, revulsion or reäction may ensue; but who can pronounce positively that such will be its operation? It is quite as probable that the healthy organs and tissues will be enfeebled, and their powers of resistance destroyed by the diminution of their organic circulation and forces, for general depletion influences all the organs in the same manner, as that it will reduce the excessive and morbid irritation of the affected tissues. In such case the ascendancy of the diseased organs will be assured by the operation of general depletion, and the collapse hastened. I have witnessed several instances of this result. No danger of this kind is incurred by the employment of local depletion. Those who object to the inefficiency of a *few leeches to the epigastrium* and abdomen, only expose their ignorance of the modus agendi of both general and local depletion. The two are as distinct in their effect, as it is possible for any two remedies to be.

Case VII. *Cholera; premonitory signs; second period; confirmed irritation.—Vomiting and purging; violent abdominal pain; præcordial anxiety; pulse full; no tendency to collapse. Temperament sanguine, nervous; the first predominant; plethoric habit.*

*August 7th.*—Miss J. aged nineteen; a full form; good constitution; complexion florid; hair auburn; eyes light; has enjoyed general good health with the exception of pain in the back at intervals for the last two years.

For the last day or two felt unwell; last night was attacked with diarrhœa, and this morning nausea and vomiting; slight febrile movement and head-ache; directed the effervescing draught with laudanum and diet; in the evening the symptoms had disappeared, and felt quite relieved.

*8th.*—The diarrhœa recurred again to-day, attended with pain in the bowels; continued to increase, and at 11 P. M. I was sent for to visit her. She was suffering from severe spasms of the bowels, returning in paroxysms every five or ten minutes; frequent dejections; discharges thin; nausea and retching, small quantity of clear fluid ejected at times; great distress and oppression at the præcordium; pulse full and frequent; face flushed; fulness of head; skin warm; v. s. to ℥xvi. was directed, but fainting took place when ℥xii. had been taken. The præcordial distress relieved; but the spasms and pain of bowels undiminished; sinapisms were applied to the extremities, and a large mint poultice to the abdomen. Enema of starch and laudanum, gtt. lxxx. which was repeated at 1 A. M. At 2 A. M. spasms ceased, and some relief obtained.

*9th.*—Pain in abdomen augmented; spasms renewed but with less violence than last night; pain more intense in lower region of abdomen; stomach quiet; thirst; diarrhœa; a number of thin watery dejections this morning; sixty leeches directed to the abdomen; absolute diet; rice water for drink.

3 P. M. Pain entirely relieved; pulse full and soft; skin warm; diarrhœa checked.

*10th.*—No pain; skin and pulse natural; bowels in proper condition.

*Remarks.*—In this case the inflammatory symptoms were the most prominent, derived from the temperament, constitution, youth, and plethoric habit of the patient. In individuals of this character local irritations almost invariably produce radiation or sympathetic irritation; diffused or radiated into other organs than those primitively affected. From the sum of vital activity or organic force with which all the organs are endowed, each organ resists the diminution of its vital organic or nutritive humour, the tendency impressed on all by an active irritation in any one; each maintains its activity, and thus prevents the movement of concentration which constitutes the collapse. General depletion in this case exercised no influence over the abdominal irritation, which immediately yielded to leeching.

The foregoing cases exhibit the general characteristics of this period of the disease, and the peculiar features impressed by the temperaments of the individuals.

The general symptoms of the disease in the first and second periods, manifested in the different organs and functions, are as follows.

1. In the nervous system—*cerebral organs and functions.* Integrity of the intellectual faculties; occasional sudden attacks of vertigo or simple dizziness, in the proportion of five or eight in one hundred; head-ache in the same proportion.—*Organs and functions of sensibility.* Little or no appreciable disturbance, except what may be referred to the state of the surfaces connected with the senses, as taste and smell being impaired from the condition of the lingual and nasal mucous membrane. In 2 or 3 per cent. neuralgic pains were experienced.—*In the nervous organs of voluntary movements.* Clonic contractions of the muscles, cramps and spasms. The cramps affect in this period chiefly, if not almost exclusively, the muscles of the lower extremities, the feet and legs especially. Cramps sufficiently severe to be the subject of complaint on the part of the patient, occurred in 15 of 21 cases. General spasms in one only.—*In the ganglionic organs;* nothing appreciable, unless the spasms of the stomach and bowels are to be assigned to this apparatus, which is at least a probable induction or hypothesis; for as yet, positive evidence is

wanting to establish its influence over the involuntary muscles. Spasmodic pains, appearing to arise from spasms of the stomach or bowels, presented themselves in 18 out of 21 cases.

2. In the organs of the nutritive, reparative, or organic functions, the *respiratory organs* are not manifestly disturbed; the function of respiration is performed in nearly its natural mode. *The apparatus of the general circulation* is not uniformly in its manifestations the same. The action of the heart, and consequently the pulse is, in many, increased in frequency; in a few acquires force, and the vessels fulness. Of the last conditions, the proportion is 20 to 30 in 100. More constant is the opposite state or diminution in the force of the heart, with feebleness and smallness of the pulse. *The organic or capillary circulation* does not depart widely from its usual state. In a small number, those in whom excitement or diffusion of irritation takes place, about 5 or 8 in 100, it exhibits an augmentation of activity in the external surface, as shown by increased temperature; and in the brain, as is displayed by head-ache, flushing of the face, and injection of the eyes. In a considerable number in the first and seconds periods, it does not exhibit any marked deviation from the ordinary state, while in others it is evidently very irregular; the internal disturbances being violent, while the skin, lips, and tongue are pale, sunk below their natural temperature, the nails purplish or blue, and the features of the face shrunken.

*The digestive apparatus* are the organs the first to exhibit manifestations of the disease, in which the morbid phenomena are most constant, the most violent, uniform, and invariable. They are truly the "throne of the disease;" from them proceed the catenation of phenomena affecting the rest of the organism; they are the first cause of all the subsequent phenomena, which must be traced up for their explanation to the pathological state of the gastro-intestinal surface, and the influence which that will exert over the whole economy. In none of the patients that came under my observation, were absent the signs of a pathological disturbance of this surface. Thirst, vomiting, purging, internal sense of heat, or violent pain in the abdomen, often the whole conjoined, were present in every case. The table exhibiting the characters of these periods is conclusive on this point. Diarrhœa was a very constant and uniform symptom. In private practice, of fifty-five patients, it was absent in four only. Pain in the stomach or intestines was next in frequency; it was only absent in six; vomiting occurred in thirty-four, it did not exist in nineteen.

*The secretory apparatus* was in many partially disordered. The urine was scant, and occasionally suppressed in this period, but not in a greater number of cases than 3 or 4 in 100. The perspiratory exhalation was not uniform in its characters, following the states of the cutaneous organic circulation. The biliary secretion appeared, from the character of the stomach and intestinal evacuations, to be generally deficient, though not invariably so.

The pathology of the first and second periods, or the correct appreciation of the symptoms, is to be ascertained alone by the aid of physiology. Anatomical pathology entirely fails us on this point. None perish in these periods; before a fatal result ensues from cholera, the disease advances into the third, fourth, or fifth periods, when changes of structure have ensued, complications have been added, and a new order of things has taken place, totally different from the condition of the first and second periods. On this account, it appears to me a preferable method to separate the two, and to form two divisions of the disease, which really exist in nature. It will lead to a clearer understanding of the disease, and enable us more distinctly to seize on the peculiar characters of each period, different from each other, and presenting specific phenomena, and nearly a specific character.

To the first and second periods of the disease, the term *cholerine* has been applied. It is the diminutive of cholera, and means a lighter form of the disease than the full-formed cholera. During the epidemic period, an immense number of these cases occur, and to decide upon the success claimed for any remedies or method of treatment, the distinction between cholerine and cholera should be kept in view, and the cases be referred to their appropriate head. The evidence of a correct treatment in cholerine will be the proportion of cases in any given number, that are arrested in this period, and do not pass into cholera.

The distinguishing symptoms of cholerine, or the first and second periods of epidemic cholera, as exhibited in the preceding history of the affection and analysis of its phenomena, are disturbances, or an anormal state of the digestive apparatus, especially of the stomach and intestinal canal. It is in the disordered functions of these organs, the disease is first announced; they remain in the same condition throughout the complaint; and their disturbance in some shape prevails in every case—is absent in none. They are the ruling organs in the disease. Now, whence proceeds this disorder of those functions; what is the condition of the organs the immediate or proximate cause of the symptoms? These symptoms and disordered function are—inappetence, nausea, eructations, vomiting, purging, thirst, soreness, pain and fulness of abdomen, tenderness of the epigastrium, tormina, spasms of stomach and intestines, and sometimes tenesmus. Some of these symptoms, I repeat, are found in every case, and in many nearly the whole are present. Symptoms precisely the same as those we have enumerated as the most characteristic of cholerine, and in all cases exhibited in greater or less number in the disease, are precisely such as result from irritating agents acting on the gastro-intestinal mucous surfaces. Small doses of an emeto-cathartic, not sufficient to produce its full effects, administered daily, will give rise precisely to the same train of symptoms. An active cathartic will often, in persons of irritable organs, cause symptoms perfectly similar to those of the second and third stages of cholera. The following cases are evidences of this fact.

*April.*—I was urgently desired to visit Miss ——. She had been affected with slight dyspeptic symptoms for some time, and was frequently constipated. Her temperament nervous. She had taken early in the morning a common dose of calomel and jalap to relieve her bowels, which had not been evacuated for three days, but from which she felt no particular inconvenience. Soon after taking the medicine she had nausea, felt very sick, pains afterwards commenced in the bowels; she had spasms, tormina, vomiting, excessive purging, and cramps. I was sent for in haste, for she felt, as she expressed herself to me, as though she was dying. Her surface was cold and pulse scarcely perceptible. Warmth, sinapisms, fomentations to the abdomen, and anodynes, succeeded in relieving her.

Mr. B——, a gentleman extensively engaged in business, is of a nervous lymphatic temperament; health has been delicate, though it has never interfered with his attention to his occupations. Finding himself costive, he took strong infusion of senna; it operated freely, but left the abdomen very sore and tender. After the operation of the medicine he went to his office; the tormina of the bowels became excessive, attended with spasms and cramps. He was carried to a carriage, being unable to walk, and taken home, when I was sent for. I found his surface, especially the extremities, quite cold, face haggard and shrunken, pulse feeble and fluttering. Sinapisms to the abdomen, warmth to the extremities, with laudanum and spt. camphor, after two or three hours brought on reäction. The next day a small bleeding was required to diminish the febrile movement.

Many other cases I could cite, as having fallen under my observation, of a similar kind. They are conclusive as to the production of symptoms, unquestionably analogous to those of the first, second, and, in instances, third period of cholera, induced by agents whose known mode of operation on the intestinal mucous membrane is that of active irritants. The same effects resulting from similar causes, and reasoning from the known to the unknown, we are authorized to infer, that the immediate or proximate cause productive of the symptoms of the first and second stages of cholera, or cholerine, as they have been termed, is an irritation of the gastro-intestinal mucous membrane. By this term irritation, I mean a complex vital phenomena, or rather combination of phenomena, inseparably united, constituting a circle of actions, and common to every tissue of the organism. It consists of vital reäction resulting from the impression of an exterior agent on an organized tissue endowed with vital activity, beyond the normal or physiological degree natural to that tissue; it is attended, as a necessary consequence, with increased quantity of vital fluid in the tissue, augmented irritability, generally augmented sensibility, and productive of disorder in the functions and mode of being of the tissue where it is developed. Such is the description of the phenomena, which, taken collectively, are intended to be designated by the term irritation.

That this condition is the state of the alimentary mucous tissue in cholerine, or the primary periods of malignant cholera, is not only clearly indicated by the actual phenomena of those periods, but is equally evident by the mode in which it is in most cases developed. In speaking of the causes of the disease, it has been shown, that in order to give efficiency to the predisposing cause, or the action of the specific epidemic principle, an exciting cause is required to call forth the phenomena of the disease, or give it being. Now, nearly the whole of the exciting causes are agents that act on, or influence immediately the alimentary mucous tissue, and are disturbing, exciting, or irritating agents. Besides, those individuals whose alimentary mucous tissue is already in a state of irritation, or of inflammation, are precisely the individuals in the community who appear to be selected out as the elected victims of the pestilence. They are the first to feel its influence, who suffer most severely under its visitation, who rarely escape its destructive energy. They owe this unenviable distinction to the irritations and inflammations already existing in the alimentary mucous tissue. This fact is a corroborating evidence that the pathology of the disease is that we have assigned to it—an irritative action developed in the alimentary mucous tissue. For, in this state, that tissue is already advanced in the line of the disease; the specific and exciting causes have less resistance to overcome than when acting on a healthy surface, and the disease consequently is more easily, rapidly, and fatally induced. Did the affection consist, as is conjectured and asserted, in a state of diminished vital activity—of a lessened force of vital reäction, and consequently of diminished irritability and sensibility, the individuals of this description, instead of yielding so readily to the morbific influence of the epidemic predisposing and exciting causes, instead of meeting them in their morbid tendencies, should offer to them the greatest opposition. The established irritations and inflammations of their tissues would prove their safeguards—they should be the last, not the first, to suffer, and their diseases, as so directly opposed to that assumed as the pathology of cholera, should render their cases the lightest and most easily controlled. The facts are the reverse, and are conclusive that this view is entirely artificial, is not fairly deducible from existing phenomena, and tends to the establishment of an incorrect practice.

The *indications of cure* founded on the foregoing principles, are the following:—

1st. To adapt the aliment as to quality and quantity to the state of the digestive forces; or to suspend entirely, or greatly to diminish the exercise of the digestive functions.

2d. To allay the sanguine and nervous irritation existing in the whole alimentary canal.

3d. To bring on diffusive excitement, or the irradiation of the organic circulation, counteracting and preventing its concentration towards the alimentary mucous tissue.

4th. To accomplish a more healthy state of action, of the secretions, and regular functional performance of the bowels.

The practical, remedial and therapeutic means, for the accomplishing of the preceding indications, are various and diversified. They are to be employed and adapted according to the particular case characterized by its distinguishing symptoms.

For the attainment of the first indication, the diet of the patient should be made to consist, in the first period of the disease, of boiled black tea, with cream, and stale wheat bread, or soda biscuits, for breakfast and supper; while rice, grits, or homminy, should constitute chiefly the dinner. Weak chicken or mutton broth, or water, is frequently most soothing and grateful to the stomach. Toast and water, barley or rice water, form the most appropriate drink. In the second period, or confirmed irritation, the diet must be absolute, or consist solely of chicken water, rice or barley ptisan.

The second and third indications are accomplished by nearly similar means; for the attainment of the one almost necessarily induces the other. These means are, 1st, immersing the feet in a warm stimulant foot-bath for fifteen or twenty minutes: the bath may be sinapised, or made of a weak alkaline ley or solution of salt. The patient is then to be placed in bed well covered, with warm applications to the feet, as bottles of warm water, warm bricks, irons, or bags of heated oats, &c. If there be much uneasiness in the abdomen, warm epithems are to be applied, and renewed as they become cool. Hops steeped in warm water or vinegar and water, and subsequently expressed nearly dry, I found very convenient for this purpose. Dry heat is to be preferred in some instances, and then a stomach warmer, or heated oats, hops, or salt contained in bags, may be resorted to for this object. In the lighter forms of the first period, or the preliminary and premonitory stages of the disease, advancing into the confirmed affection, the above treatment very generally suffices to dispel the symptoms, and arrest its progress in the course of one or two days. The observance of a proper regimen is all that is, then, requisite to protect against a relapse. This I found was the greatest difficulty in the management of patients. The restoration to a state of comfortable feeling was considered as a license for indulgence, but as the specific predisposing cause is in constant operation during the epidemic period, the necessity for attention to the prophylactic or preventive regimen still continues. It is even more imperative, as the attack already suffered, leaves the alimentary surface more irritable, more sensitive to impressions, and of consequence, more disposed to perturbating actions from light exciting causes.

2d. The administration of diffusive excitants in small doses, in order to ensure their introduction into the economy, and the general or diffused excitement through the organism. One of the most frequently employed of these, was the alcoholic solution of camphor. The partizans of Hahnemann and the homœöpathic doctrine, extol camphor as a specific; but, from my own experience of its operation, I am satisfied that its action is diffused excitement. Taken in small doses, I have found a sentiment of warmth and glow to be developed on the surface, succeeded by a gentle, warm transpiration. This is the precise reverse action of that to which a constant tendency exists in the first and second periods of the disease, and which is counteracted by the action of camphor. The Hahnemannists condemn its association with opium in any shape. My own observation does not confirm the correctness of this interdict. On the contrary, I found great advantage from the combination; and the cases in which the camphor proved most useful, were the light forms of the first period, with nervous pains of the abdomen. The dose in which it is administered, is from two to five drops, mixed with cold, sweetened water, and given every fifteen minutes, half hour or hour, according to the urgency of the symptoms. The premonitory symptoms were, in immense numbers of cases, controlled by this remedy, and in the incipient stages, I have seen the most decided effects when the symptoms were principally of a nervous character. Other mild diffusible stimuli were however of equal utility, which is an evidence that in camphor there is nothing of a specific mode of action. Aqua ammoniæ in the dose of two drops, combined with five or ten drops of tinct. opii, and given in sweetened water, answered quite as well. The following prescription I frequently used, and found it to succeed equally with the camphor in the same class of cases:—℞. Tinct. lavend. comp., tinct. camphoræ, āā. ʒiv.; liq. Hoff. anod., tinct. thebaic, āā. ʒii. M. ft. mit. From ten to twenty drops of the above were administered at appropriate intervals.

In the cases in which the nervous symptoms were less decided, I generally directed the following prescription:—℞. Massæ hydrargyri, gr. viii.; ext. opii aq., pulv. ipecac., āā. gr. ii. M. Divid. in pill. iv. One of these pills was given every two, four, or six hours, according to the symptoms.

When the inflammatory symptoms were not very acute, the symptoms frequently became mitigated by the preceding remedies. But whenever the vomiting and purging continued, accompanied with severe pain in the abdomen, then I had recourse to sanguine depletion, either general or local; or both, according to circumstances. General depletion was practised in the limited number of cases, in which the pulse was full and excited; but in the others, leeches or cups to the abdomen were found the more effectual and safer proceeding. It is surprising to witness how prompt often is the alleviation and abatement of the symptoms, following the application of from thirty to sixty leeches to the epigastrium and the iliac regions. In no instance did I find it necessary, in the patients I treated in the first stages, to repeat the local depletion. One application was sufficient to procure a favourable result. In several instances general depletion made but little impression, while a very prompt relief ensued upon local depletion.

General blood-letting is but partially applicable to the cases of cholera. It should be restricted to those only where the constitution is vigorous, and the patient has not been enfeebled by age, previous diseases, or dissipated living; and where the forces of the general circulation do not exhibit a manifest tendency to failure. In those cases in which it proves an available and salutary remedy, its operation is the reduction of the internal irritations, and the inviting to a revulsive movement, coöperating in this mode with, and facilitating the diffusive or centrifugal action of the means put into operation for this object. This important movement, the *great recuperative action* of the organism in the *natural cure* of diseases, is based upon the vital forces of each organ, the susceptibility and capacity of each organ to assume and maintain vital reäction. Now, this state depends on the activity of the organic circulation in each organ, and its supplies of the vital sanguine fluid, the great energizer of vital reäction. If, therefore, this be abstracted below the sum necessary to maintain the vital reäction of each organ in the degree essential to its functions, a state of asthenia, sedation, or exhaustion, is the necessary consequence, and diffusion of irritation, irradiation, reäction, and a centrifugal movement, tending to the equalization of the organic and general circulations and the forces of life, become nearly or quite impossible. Whenever the signs of concentration are rapidly approaching, or the state of collapse, so named, is imminent, general depletion is then a most equivocal, nay, a hazardous remedy. Should it fail to remove or greatly to lessen the centrifugal force of the internal irritation, and produce a revulsive operation, its effects must be most disastrous. Its direct action being the abstraction of blood from the general circulation, the force of this, the energy of the heart's contractions, the supplies of sanguine vital fluid sent into the organs for the sustentation of their vital reäction, all are diminished, and of necessity the whole organism is prostrated. The sedation resulting from general depletion, cannot, from its mode of action, be directed so as to influence those organs exclusively whose vital reäction is in excess. All are influenced alike, and the revulsion or diffusive excitation, which is merely favoured by general depletion, is dependent on other causes, which we neither can absolutely command, nor whose presence even can we know by any positive signs. To resort to this remedy, therefore, when the failure of the forces of the general circulation evidences the exhaustion already induced in the sum of the sanguine vital fluid by the concentrative energies of the internal irritations, is to throw ourselves on the chapter of accidents, with this serious disadvantage, that the loss of our hazard is irretrievable ruin, must almost inevitably prove fatal.

Local or organic depletion offers none of the objections or difficulties attendant on general depletion. Its mode of action is totally distinct, and it is applicable to numerous cases where general depletion is entirely inadmissible. In local depletion the blood is not abstracted from the general circulation directly, and its influence is not that of a direct debilitating remedy immediately producing an exhausting, debilitating action on the whole organism. Its operation is restricted to the organic, or as it is termed sometimes, capillary circulation, and is attended with a local irritation or excitation, resulting from the means by which it is accomplished. The common universal result of local irritation or excitation is thus produced—an afflux towards the part irritated or excited—but the escape of the blood, preventing the formation of a congestion, which arrests this movement when a simple rubefacient is employed, and limits its influence, renders it continuous when caused by local depletion, extends it into a wide, expansive area, and often causes a decided and marked affluxive movement through the whole organic circulation. By the establishment of this movement, a direction is given to the organic circulation towards the point where the local depletion is made and the blood is escaping; towards this point does the sanguine fluid tend, and diminishes consequently in those the most opposite, and hence arises the peculiar and admirable effects to be obtained by the employment of this means—effects more frequently applicable in the treatment of disease, and of more decided and beneficial agency than most other therapeutic remedies at our command. It is a remarkable fact, that the debilitating or sedative action of local or organic depletion is at the points the antipodes of that where the depletion is made. The application of the means used for this purpose is not a matter of indifference. The position selected for the application in most instances, there are exceptions under certain circumstances, should be directly opposed to that intended to be influenced. Were this the place, and the digression would not be too long, I could cite numerous facts in support of the axiom. A very little experience with these means is sufficient to give the demonstration even to casual observers of its accuracy. Local depletion from the thorax, it is known to all, will not give relief in the inflammations of the abdominal viscera, nor when made from the abdomen, prove beneficial in the inflammation of the thoracic organs. Did local or organic depletion accomplish its effects merely by the abstraction of blood, it would be indifferent whence the blood was taken, so that the amount was the same; but the contrary is too well known to be contested.

In what manner local depletion causes this affluxive movement in the organic circulation, and expends its influence on tissues different and remote from that whence it is made, can no more be explained than can the same operations be explained as resulting, though in a lesser degree, from the action of rubefacients, vesicatories, cauteries, and other revellent measures. These operations depend on the forces and laws of the organic, vital and molecular circulation or movement of the sanguine fluid in the tissues. The mechanical or general circulation—the movement of the sanguine fluid in masses or columns to and from the respiratory surfaces, and to and from the nutritive surfaces or organic tissues—accomplished by physical forces and on physical laws, has been well investigated, and is almost, though not completely, elucidated. But as respects the organic textular circulation, our information is very limited. We know nothing of the forces producing and maintaining, and but partially the laws that govern it. It is dependent on the same forces, and governed by the same laws, that are the causes and regulators of vital reäction, or the phenomena of vitality. As the mode of action of these forces is unknown, inscrutable, it is not possible to assign the mode in which this great vital phenomenon, so deeply concerned in the pathological condition, and of so great moment in therapeutic operations, is accomplished. We must therefore be contented with the facts revealed to us by observation, and attempt the establishment of those general principles or laws—the coördination of the facts in the order of their dependance, which are obtained by a well-regulated experience.

In addition to the foregoing means, I prescribed, when the stomach was much distressed with nausea and vomiting, the effervescing draught of Riverius, to which was added the black drop. Frequently I made the solution of the bi-carbon. potassæ in the aqua camphoratæ, according to the following prescription:—℞. Bi-carbon. potassæ, ʒiv.; acetat. opii, gtt. xv.; aquæ camphoratæ, ℥iv. M. ft. solut. Half an ounce, mixed with an equal quantity of lemon juice, was given in the act of effervescing. The dose was repeated every hour or half hour. This draught was often very grateful.

To allay the thirst, and at the same time to abate the gastric irritation, iced water in small quantities, or iced gum water, very slightly acidulated with lemon juice, and sweetened, was allowed for drink. The iced carbonated or Seltzer water was also a general beverage, and highly grateful to the stomach. In many instances ice itself was given in very small pieces. One of the patients I attended early in the epidemic attacked with the disease, was so delighted with the relief he experienced from iced drinks and from ice, that when I subsequently saw him, he would cry out "give them ice."

By allaying the intense sensation of thirst, which often amounts to agony, one of the sources of nervous disturbance and irritation is cut off. Cold also acts as a direct sedative on the gastric mucous membrane, and the decided relief obtained by its employment, while it establishes the propriety of the treatment, proves clearly the highly irritated state of that organ, and the kind of agency resulting from cold drinks. The diminution of the irritation of the gastro-intestinal surfaces, by weakening the centripetal action, is the most efficient step towards establishing a diffusive movement, in promoting irradiation or reäction, and rendering more efficacious the operation of the external revellents, the cutaneous reäction caused by sinapisms, frictions, heat, leeches and cupping, or the force producing a centrifugal movement.

4. The last indication in the treatment of the first and second periods, or of cholerine, in the cases in which it arises, and in my practice they were very few, is attained by the administration of mild laxatives or eccoproctic remedies. The treatment already indicated in the cases under my charge, was generally adequate to the entire protection of the individual from the invasion of confirmed cholera, and to the perfect restoration to a healthy condition of the alimentary canal. In two of fifty-five patients, a costive disposition ensued, which continued for several weeks; but finally disappeared by the combined employment of appropriate regimen and laxatives. In one, an alkaline infusion of rhubarb was employed; in the other Saratoga water. In two, more uncomfortable feelings, and occasional tormina, continued to recur at intervals. This was removed in one by fifteen grains of rhubarb; in the other by small doses of calomel and opium, with castor oil in the dose of one drachm. These were the only cases in which I found it necessary to prescribe in order to bring the bowels into a natural condition after the cholerine symptoms had been removed. They were the only instances also in which I employed any purgative or evacuant medicines.

This class of remedies has been very strongly advocated by many highly respectable authorities, and even those of an active and drastic character warmly recommended. My conviction, the result of the pathological views I adopted of the disease from a physiological translation of its symptoms, was decidedly opposed to their administration. The modus operandi of these remedies, and that of the most numerous exciting causes of the disease, are perfectly analogous; the symptoms produced by each are nearly the same, the surface or organ primarily affected by both identical—they are then acting in the line of the predisposing cause, and must in numerous instances, it is not necessary for the rule that it should be universal, become its exciting cause, and hurry on its progress through the first stadia into the period of collapse. Several instances of the kind came immediately under my notice. In one of the earliest cases that occurred in this city, a dose of fifteen grains of calomel was taken at bed-time, on account of a sense of uneasiness in the bowels, collapse came on under its operation before morning, in which the patient succumbed.

July 30th, Dr. Loughran requested me early in the morning to visit with him a patient, the first he had seen with cholera, to whom he had been called in the latter part of the night. This man had taken an ounce of salts in the evening, the purging was excessive, he sunk immediately into collapse, and died between eight and nine in the morning.

A stout white man, a labourer, called at the apothecary store of Henry Zollickoffer, in the height of the epidemic, and bought a dose of calomel and jalap. He observed, that being costive, he intended to take it. A caution was given to him, and a request urged on him by Mr. Zollickoffer to diet himself, and not to take the medicine. This he refused, remarking that his bowels were hard to be moved, and required always a strong dose. This man was seized with cholera under the operation of the medicine, and was a corpse at twelve the next morning.

Other instances of the same kind came to my knowledge, and they at least deserve a serious consideration. Dr. Thomas Spencer, President of the Medical Society of the State of New York, in a compendious but very judicious tract, "Practical Observations on Epidemic Diarrhœa, &c." confirms my own observation and testimony as to the injurious tendency of active cathartics in the early stages of the disease. The following are his remarks on this subject. "In condemning the use of cathartics in this disease no favourite theory is to be regarded. *I have in several instances witnessed their fatal effects under my own prescription and observation.*"

For some time anterior to the appearance of the epidemic I had observed a strong disposition to intestinal affections, and an irritable condition of the bowels, that rendered them intolerant of the operation of purgatives. In June a gentleman whose family I attend, sent for me in the evening to arrest a hypercatharsis, induced by half an ounce of castor oil, which he had taken in the morning to obviate an uncomfortable feeling in the bowels. In the latter end of May I had a severe case of cholera followed by a gastritis that continued several weeks, brought on by an indigested meal and a purgative. During the prevalence of the epidemic it was an observation of many practitioners, that in the treatment of other diseases than cholera, it was necessary to observe great caution in the administration of purgatives, as they operated with a violence that was unusual, and by no means desirable. Since the cessation of the epidemic the same fact continues to be a subject of observation. Within a short period my valued friend, Professor Chapman, has mentioned to me, that he was near losing a young lady from the excessive action of a single Seidlitz powder, followed by an enteritic fever; and that in the same week, he had been called to arrest hypercatharsis in another patient from the same dose.

The propriety of particular remedies, or a specified plan of treatment, can only be established by comparative results and diversified observation. In the cases of the first stages of cholera that were submitted to my treatment, no purgatives were employed, and the whole recovered very speedily; not one passed into the fourth period, or that of collapse. In my exclusive private practice but one patient reached that stage, and it was formed before I arrived.

It should, however, here be remarked, in order to possess an entire view of the subject, and to arrive at just conclusions, that the patients of private practice were all persons of perfectly temperate habits, of easy circumstances, and regular lives, with three exceptions, and those are the subjects, the most favourable for treatment, in whom remedies procure their desired effects, and the disease is most certainly arrested in its course.

Emetics I did not employ in the periods of the disease under consideration. Having found the method I have detailed successful in its results, I did not feel the necessity of resorting to any other. As a centrifugal movement can generally be obtained by a careful exhibition of emetics properly managed, I can readily believe that an emetic operation procured by ipecacuanha, moderated by a mild opiate, or by a sudorific emetic, as the eupatorium, might be advantageously employed. In my hospital practice, the combination of ipecacuanha, opium, and mass. hydrarg., in two instances acted as an emetic. In both the stomach was loaded with indigestible food, and the emetic action was decidedly beneficial. The patients soon entered into convalescence.

The following cases are examples of the first periods of cholera, and will illustrate the treatment.

CASE VIII. *Cholera of first period; irritation; purging white stools; vomiting; pain of abdomen; cold surface; cramps of the feet.*

Madam H——, aged forty-five years, nervous temperament, has been since last fall affected with disorder of the alimentary functions, alternate costiveness and diarrhœa. July 10th, feeling uneasiness in her bowels, and disordered digestion, she took ʒi. of magnesia in the evening. Diarrhœa, with spasms and pains of the abdomen, becoming excessive, the next day she sent for me.

11*th.* Frequent purging; stools which were formerly dark and very offensive, are now white and without odour; pain in abdomen very severe; nausea, and occasionally slight vomiting; pulse small; temperature of skin below natural standard. Directed dry heat to lower extremities; sinapism to be laid over the whole abdomen, and the following pills:—℞. Mass. hydrarg., gr. iv.; ext. opii, pulv. ipecac. āā. gr. ii. M. divid. in pill. iv. A pill to be taken every four hours. In addition, an enema of tinct. thebaic, gtt. xxx. in mucilage was ordered. Chicken water very thin for drink.

*12th.* Vomited this morning—slight tinge of blood; diarrhœa had been arrested in the night; slight head-ache; constant nausea and thirst; cramps in the feet; surface cold. Iced carbonated water for drink.

Evening. Return of pain in abdomen, and diarrhœa. Repeat the pills; sinapism to abdomen, and injection of laudanum.

*13th.* Diarrhœa arrested early in the night; slept well; temperature of the skin natural; has no nausea.

A sense of chilliness continued for several days to such an extent that the patient had a fire in her room, and slept under several blankets.

Case IX. *Cholera, first period, or incipient irritation; diarrhœa; vomiting; pain in abdomen.*

Jane Jackson, a coloured woman, aged twenty-four years, good constitution, was employed in the hospital as a nurse. She had undergone great fatigue in attending on the patients, rubbing them, and had been able to obtain for several days and nights but little sleep.

*August 12th.*—Was attacked with diarrhœa and vomiting, accompanied with pain in abdomen, augmented by pressure. Blood was drawn from the abdomen by cups, and sinapisms applied to the extremities and abdomen. She was kept warm in bed, and given diluting drinks. The symptoms immediately subsided, and next day she returned to her duties.

Case X. *Cholera, first period—incipient irritation; vomiting; purging; pain in abdomen.*

*August 1st.*—Constance Graffain, aged sixty-nine years, a nurse in the hospital, was attacked in the night with violent purging; her bowels she represented as incessantly opened for a few hours; vomiting occurred but slightly; she complained of pain in the abdomen.

The attack had been induced by excessive fatigue and loss of rest.

In constitution the patient was feeble, and zeal and ardour in the performance of her duty led her to exertions too great for her strength.

At the visit of the morning I found her complaining of nausea; the tongue furred; the epigastrium very sensitive; abdomen painful; occasional vomiting; temperature of surface diminished, and pulse feeble. Fifty leeches were applied to the epigastrium, and the camphorated effervescing draught administered. The symptoms immediately abated. The next day she was convalescent. From her age she did not immediately recover her strength, but on the 4th resumed her duties.

The two last cases are examples of the light form the disease presents in thousands of cases in its commencing period, and when it is in almost every instance perfectly curable if timely application be made and an appropriate course be pursued. A vast number of similar cases could be adduced in illustration of the character of the disease in this period and its perfect tractableness.

Case XI. *Cholera, second period; premonitory symptoms, purging; vomiting; cramps.*

*July* 13*th*.—E. D., lymphatic-nervous temperament; pale complexion; large frame; enjoys excellent health; habits unexceptionable in every respect; he has had the bowels and stomach disordered for several days past; eat notwithstanding beef and beans at dinner; during the evening was very chilly; went to bed, and awoke after twelve o'clock, with purging, vomiting, and pain in the abdomen. I was immediately sent for. I found him vomiting violently; a clear fluid with some flocculi discharged from his stomach; large dejections from his bowels; complains exceedingly of severe pain in his abdomen; muscles of legs and thighs strongly cramped; thirst excessive; pulse small; surface cold; features considerably shrunken, so as to change the expression of the countenance; voice enfeebled as from a cold.

A sinapism was applied to the abdomen, and on each leg; dry heat to the extremities. The effervescing draught, with the addition of sulph. morphiæ, gr. ii. to ℥vi. of the solution, and kept cool with ice, was given every twenty minutes. Carbonated water also iced was given every few minutes in table-spoonful doses.

At 4 A. M. the vomiting and purging were checked; the pulse became stronger and fuller, and the skin less cool. At 5 A. M. the cramps ceased.

14*th*, 9 *A. M.*—Very much exhausted; strength greatly reduced;

looks haggard; skin has not recovered its temperature; thirst most distressing. Small pieces of ice held in the mouth, and iced carbonated water continued—both most grateful to the patient.

11 *o'clock.* Feelings much more comfortable; skin nearly of natural temperature; thin chicken water.

Evening. Symptoms entirely relieved.

Case XII. *Cholera, second period; diarrhœa; vomiting; serous discharges; cramps; pain in abdomen.*

*July 24th.*—Called to visit H. G. aged ten years; sanguine nervous temperament; florid complexion; light hair and eyes; had arrived a few days previously from New York. During yesterday was frequently purged, and the same throughout this day. The disease augmenting, and severe pain in the bowels coming on, I was sent for at 10 o'clock, P. M. At this time a thin clear fluid was ejected from the stomach; the bowels were moved every half hour; the dejections watery, of a brown colour; the pain in abdomen was violent; pulse small, and surface cool. Warm fomentations were applied to the stomach, dry heat to the extremities, and the following prescription directed:—℞. Calomel, gr. iv.; ext. opii, pulv. ipecac. āā. gr. ss. Divid. in pul. iv. A powder to be given every two or four hours, p. re nat. An enema of mucilage, ℥iv.; tinct. thebaic, gtt. xx.; chicken water for drink.

*25th.* During the night had repeated attacks of cramps and abdominal spasms, arousing him from sleep; this morning vomited several times; profuse discharge in the middle of the day from the bowels in the bed, of a clear watery fluid; sinapism to abdomen; continue powders, and repeat enema. In the evening, symptoms abated; pulse has more volume; skin of good temperature; pain subsided.

*26th.* Slept well; convalescent.

Case XIII. *Cholera, second period; purging; vomiting; cold surface; blue fingers; cramps.*

*August 7th.*—Mary M'F. aged thirteen years, had diarrhœa yesterday and during to-day. In a small court immediately in the rear of the dwelling, four fatal cases of cholera had occurred in the last three days.

I was sent for at nine in the evening. Vomiting had taken place; discharges thin and clear; frequent purging; pulse small and feeble; skin cold; extremities of fingers blue; cramps in the legs. I directed a foot bath of hot ley; a sinapism to the abdomen; warm applications to the feet, and to be covered up warm. The following preparation of the effervescing draught to be administered every hour:—℞. Bicarbon. potassæ, ʒii.; acetat. opii, gtt. xii.; aqua menthæ pip., ℥i.; aqua camphoratæ, ℥iii. Ft. solut. Half an ounce, mixed with an equal quantity of fresh lemon juice, to be given every hour.

*8th.* Before daylight reäction came on; the skin became warm; the vomiting and purging ceased. Chicken water for diet.

Evening. Convalescent.

Case XIV. *Cholera, second period—confirmed irritation; purging; vomiting; spasms; cramps.*

*July 30th.*—Naomi Francis, a coloured woman, aged fifty-one years, robust constitution, a washerwoman, lived in a cellar in the court adjoining the hospital; habits temperate; food of a coarse, indigestible nature, and has eaten raw cucumbers and boiled corn. This morning was attacked with diarrhœa, and has had during the day numerous copious stools, thin, watery, and of brown colour, mixed with indigested corn. This afternoon vomiting was superadded to the diarrhœa. About 5 o'clock was seized with acute pain in the back, followed with intense pain in the bowels, cramps of the abdominal muscles and those of the legs. At 6 was brought into Hospital No. 5. Symptoms on admission were, in addition to the preceding, constant sickness of stomach; tongue furred, and red on edges; colder than natural; pulse 112, and small, extremities cold; elasticity of skin diminished, which was bedewed with cold sweat; countenance distressed. Dr. Turnpenny, assistant physician on duty, saw her, and administered calomel, gr. vi., opii, gr. ss., but which was immediately rejected. Some alcohol was applied to the abdomen and inflamed so as to cause an instantaneous vesication. The effect of this was immediate in arresting the cramps and spasms of the abdominal muscles. The camphorated effervescing draught, with acetat. opii, gtt. iv. to each dose, was given every half hour, and the extremities surrounded by hot oats; cold flaxseed ptisan for drink.

*10 o'clock, P. M.* Has vomited twice since admission; several discharges from bowels; cramps very slight; skin warmer; pulse fuller and slower; slight shrivelling of fingers; feels comfortable; pain of abdomen subsided. Same treatment continued.

*31st.* Vomited twice in the night; cramps occasionally troublesome; had two very copious liquid discharges of green colour; had some sleep; skin has warmth, and is moist; tongue furred and red on edges; pulse natural. Draught continued occasionally with iced gum water.

*10 o'clock, P. M.* Vomiting has ceased; one discharge from bowels, more natural. Treatment continued.

*August 1st.*—Convalescent. Chicken water.
*2d.* Discharged cured.

Case XV. *Cholera, second period—confirmed irritation; purging; diarrhœa; abdominal pain and spasms; cramps.*

Robert D. Griffin, tailor, aged twenty-two years, admitted into hospital July 30th; is subject in the summer to slight bowel affections. On admission was affected with vomiting and frequent purging; abdominal muscles affected with spasms; pain in the abdomen, greatly increased by pressure; tongue slightly coated with white fur; great thirst; pulse feeble and very compressible; countenance anxious; surface cool.

The camphorated effervescing draught with acetat. opii was administered, and the abdomen covered with scarified cups; dry heat applied to the extremities by means of hot oats, and the same around the body; frictions constantly maintained over the whole surface; iced water for drink.

The vomiting and pain of abdomen abated very soon after the application of the cups; the cramps ceased, and the general symptoms improved rapidly.

*31st.* Symptoms entirely controlled; continues the draught occasionally; toast water for drink. But one stool during the day.

*August 1st.*—Convalescent. Chicken water for diet.

Case XVI. *Cholera, second period; diarrhœa; cramps.*

William M. Downing, a black, intemperate habits, though constitution has not suffered; hod-carrier; admitted in hospital August 11th. He has been labouring under diarrhœa for the last twenty-four hours, which still continues, accompanied with severe cramps. To controul these a tourniquet was applied tight on the right thigh; pulse had force, but small; v. s. was performed to ℥xii. The following pills directed:—℞. Mass. hydrargyri, gr. ii.; pulv. ipecac., gr. ss.; pulv. opii, gr. ¼. M. ft. pill. A pill to be given every two hours.

After taking the first pill he vomited a large quantity of indigested cabbage. A second pill was given, and a basin was nearly filled by vomiting of the same substance. After vomiting he felt much relieved. Effervescing draught was directed.

In the evening symptoms had abated; pulse was developed; skin of good temperature. The cramps entirely ceased.

*12th.* No return of symptoms. Arrow root.

*13th.* Sense of constriction in the stomach, and epigastrium painful. Scarified cups applied, and ℥vi. of blood taken.

*14th.* Convalescent.

The object of the preceding observations has been to investigate the character of the symptoms, to determine the nature, and illustrate the treatment of the first and second periods of the disease. These periods, when the disease does not pass beyond them, compose a distinct group or class of cases, exceedingly numerous during the prevalence of the epidemic, and which may be designated by the name cholerine, or choleroid, that has been already applied to them. The conclusion to which we have arrived, as the result of the analytic examination we have made, is, that in those stages, cholera is an irritation developed primarily in the mucous tissue of the alimentary canal. In order to understand the production of the succeeding stages, or cholera in its malignant aspect, it is necessary to fix the attention on the first periods, and to resolve in a positive manner the causes and nature of their phenomena. They are the initiatory phenomena, of which those that succeed are the sequences, and follow from them as effects. A neglect of this method has most probably embarrassed investigators in their researches. They have regarded cholera only in its last periods, when complications have been induced, and a new condition—accessary phenomena—have been added or engrafted on the primary, and which can only be understood by keeping them distinct. But still more fully to comprehend the subject, and to comprise the whole results in our view, it is requisite to direct attention, 1st, to the pathological phenomenon meant by the term irritation, and its effects; 2d, the anatomical nature of the structure affected; 3d, its physiological character, or the offices or functions it executes; 4th, its great extent; and lastly, its connexions. Unless the whole of these considerations are embraced in our examinations, we shall possess most incorrect ideas of the nature of the disease, and be little able to appreciate justly its phenomena. Inattention to these combined circumstances has rendered the disease a puzzle and a mystery. Irritation has been looked upon as a unit in its phenomena and effects, whereas both are exceedingly diversified. The consequences of irritation as located in the stomach, or colon, or rectum, have been compared to the symptoms of cholera, and being different, it has been at once concluded, that cholera was wholly unrelated to irritation. The error lies in the narrow, contracted, gimlet-hole view in which the subject has been regarded. All the phenomena which are comprehended in irritation, that inherently belong to it, are not brought forward and displayed in the connexion they maintain with each other, and hence the erroneous opinions enunciated from the imperfect ideas formed of this great and extensive pathological state.

It would be improper here to enlarge on all the points indicated as intimately connected with the present inquiry, but before proceeding to the investigation of the phenomena constituting the second group of cases—the third and fourth periods of the disease—it will be necessary for the comprehension of our views to make some general observations on each of those heads.

1st. Irritation has already been defined.* Its essential phenomenon is vital reäction in a degree beyond the point natural to the tissue in which it is excited. But as the sanguine fluid element of the organism is an essential element in all the organic actions, on which they immediately depend for their activity and energy, irritation or vital reäction in excess necessarily implies an augmented quantity of the sanguine fluid and increased activity of circulation, as its primary state, in every tissue where it is developed. The effects—the consequences of irritation, are of various character, and they are further modified by the tissue, the condition of the sanguine fluid, the temperament of the individual, the activity of the sympathies, and a variety of other circumstances. Independent of these modifications, the other primitive effects of irritation are, 1st, general affluxive movement in the organic circulation; 2d, augmented exhalation and secretion, somewhat modified in properties from the natural fluid secreted; 3d, raptus, or molimen, productive of hæmorrhages, congestion, or apoplexy; 4th, inflammation; 5th, when chronic, gradual alteration of structure. They are not necessarily connected, but any one may result from irritation without the concurrence of the other, except the first. Such are the primary effects of irritation, though each is susceptible of modifications from the causes above enumerated.

2d. The anatomical structure of the surface or membrane, the location of the irritation, it is necessary to signalize, in order to be able fully to appreciate the phenomena of the disease. The alimentary mucous membrane is one of the most important and complex parenchymas of the animal organism. There enters into its composition the common cellular tissue; the angeal or vascular tissue, in such abundance, that when the blood-vessels or lymphatics are injected, this tissue appears to compose nearly the whole of the membrane; while nervous tissue, in connexion principally with the ganglionic apparatus of the nervous system, is scarcely less in quantity; and with these the muscular tissue is closely associated in the formation of the muscular layers of the alimentary tube. But in addition to these, the primary elements of the animal structure, the glandular parenchyma, is extensively combined with them. So numerous are the se-

* P. 322.

cretory cryptæ and follicles imbedded in this structure, the disseminated glands, (the glands of Brunner,) and those aggregated together, (the glands of Peyer,) it can scarcely be regarded as exaggeration to assert, that the alimentary canal is an extended, hollow, or tubular gland. By positive calculation these glands in the intestinal tube have been estimated to amount to forty thousand, an estimate we are convinced below, rather than above the actual number. Without this anatomical view of the true character of the structure primarily and principally affected in cholera, it is hardly possible to form correct ideas of the phenomena and results of irritation when called into existence in it, or the mode in which irritation may be productive of the phenomena of cholera.

3d. The physiological character of the alimentary mucous membrane, or more properly parenchyma, is of the highest order. There are connected with it, made dependent on its natural structure, some of the most important functions of the organism. It is the seat of the internal senses that announce the sufferings of the economy, for the want of the liquid and solid elements of the structure when they are deficient—an annunciation made by the sensations of thirst and hunger, amounting to the intensity of agony, when the want becomes threatening to the existence of the being. It is further, as may be seen from its anatomical composition, an exhaling surface and a secreting organ. Like the external tegument and the bronchial mucous membrane, it furnishes a constant exhalation of watery vapour. As in the skin this assumes the form of sweat when poured out in large quantity, so in the alimentary mucous membrane, when it is inordinately increased, it forms watery and serous discharges. The secretory cryptæ and follicles so profusely provided furnish the various secretions, the general mucous lubricating the whole of this surface, the fluids required for the processes of chymification, in part for chylification it is probable, and for the process of fecation. The quantity of this secretion is frequently immense, as is seen in the amount often evacuated by active cathartics, and which occur in various diseases of the intestinal canal.

In addition to this character of an immense secreting organ and exhaling surface, the alimentary mucous membrane or parenchyma, has deputed to it the functions of digestion—chymification, chylification, and fecation—all of which are dependent on the healthy condition of this structure. The moment it departs from this state in any portion executing any one of those functions, immediately that function is deteriorated or wholly destroyed; and the organism begins to suffer from the immediate and sympathetic consequences of the loss of those functions.

4. The extent of the structure implicated is a consideration of the first import in arriving at an appreciation of the phenomena and results of disease. The mucous membrane or parenchyma of the alimentary organs, by its disposition in folds and arrangement, is of much greater extent than the mere length of the intestines; now these are estimated to be from twenty-five to thirty feet in length, and as forming a surface equal to, if not greater than the whole exterior surface of the body. In the analysis of the phenomena of the first periods of cholera, by the physiological appreciation or translation of the symptoms, it is apparent, that this surface, the alimentary mucous parenchyma, is primarily affected, is the seat and origin of the disease, not limited to a single zone or compartment, or a single element of this extensive and compound structure, as is the case with so many diseases, some of fatal consequences, but is spread over its whole extent, involving all its elements, and deranging, or entirely subverting all the important functions that belong to its natural condition.

A moment's reference to the affections of the external tegumentary parenchyma, so analogous to the internal mucous parenchyma in many respects, will more strikingly elucidate the character of the affection, and remove all difficulty in reconciling the phenomena of cholera to an irritation developed in and occupying the whole extent of the intestinal mucous membrane.

A simple scald, of limited extent, produces no constitutional effects, but if it is general over the whole surface, though not of sufficient intensity to destroy the vitality of the skin, or in any *direct* manner disturbing or interfering with any process or function essential to existence, but merely by the irritation it provokes over so extensive a surface, influences secondarily those organs whose vital activity is indispensable to maintain the functions of the organism, and death most generally ensues, preceded with various phenomena, according to the constitution and temperament of the individual.

An erysipelatous inflammation occupying but a small space, is an affair of no moment; but if it be spread over the whole head, or a limb, or a greater extent of the body, it is then frequently fatal, and its mortality augments in proportion to the extent of the exterior surface it invades at one and the same time.

The acute pustular inflammations of the skin, when the pustules are numerous, the irritation active, and consequently this parenchyma extensively and profoundly affected in its various elements, extends a perturbating influence to other organs of the economy, and becomes a very fatal disease.

In those instances we are presented with the fact, that an active and extensive irritation existing in the external tegumentary parenchyma, although no function deputed to that structure is immediately connected with vitality, will prove rapidly fatal, by the secondary effects it extends or propagates into the internal surfaces and organs directly connected with the essentially vital functions.

If we have thus the demonstration made to the senses of an irritation primarily seated in the cuticular parenchyma, destructive of the essential functions of the economy, how can we hesitate to admit, that an irritation, involving the whole extent, and every anatomical element of the alimentary tegumentary parenchyma, to the destruction or disorder of all the important functions attached to its natural conditions, and a similar disturbance and disorder necessarily induced in every important organ and function of the organism to which this structure is immediately and intimately associated, may be quite adequate to give rise to all the phenomena we witness in cholera.

An irritation of an active character placed in this structure, though of limited extent, is productive of great disorder in the whole economy, and is often of fatal result. This is seen in a gastritis, duodenitis, enteritis, and colitis. But in cholera, the structure invaded, not by one, but the whole of those formidable diseases, is at one and the same moment, the subject of a violent irritation. The symptoms of those affections, modified by their complication, and by the extraordinary influence carried into so many of the organs and functions, by so extensive an affection, may be very clearly traced in the commencing periods of the disease; and this combination, as it were, of the most severe irritative diseases of this structure, readily explains the rapidity of its course, the alarming character of its symptoms, and its great mortality.

5. As a last circumstance required to comprehend completely the production of the symptoms or phenomena of cholera, as dependent on an irritation of the alimentary mucous parenchyma, are the connexions associating this structure with the other organs of the economy. A direct connexion is maintained with the biliary and pancreatic apparatus, by the continuity of this same structure through the excretory ducts into the very interior of the glands. They

may truly be viewed in the light of mere appendices to this structure.

With the external tegumentary parenchyma it is continuous also, the one passing into the other at the openings where the internal surfaces communicate with the exterior; the one forming the external, the other the internal surface of the body, the trunk of which may be regarded, not inaptly, as a hollow cylinder. It is further continuous with the bronchial mucous or tegumentary parenchyma, which is a reflexion of the alimentary mucous membrane. From this disposition of the tegumentary parenchyma, its two divisions, external and internal, and often its pulmonary mucous membrane, are placed in antagonizing positions, balancing each other in their forces and the amount of circulating or sanguine fluid they contain. A great ascendancy acquired by the one, will be at the expense of another, and place it in a state the opposite of itself. The phenomena of numerous diseases establish this fact.

The nervous connexions of this structure are twofold—that with the ganglionic nervous apparatus, and that with the cerebro-spinal nervous apparatus. The first is the most intimate and important; a single glance at the plate arranged by M. Manec, and reprinted in this city by Dr. Pancoast, will be sufficient to strike the most careless observer, with the large amount of nervous tissue belonging to the ganglionic apparatus appropriated to the organs of the digestive functions. The alimentary parenchyma is placed in immediate connexion with the various ganglions and plexuses arranged along the abdominal spine, and through them, with the numerous organs with which they are in connexion, devoted to the functions conservative of the individual. This parenchyma is also in relation with the cerebro-spinal apparatus, directly with the cerebral organs of sensibility and muscular motility by the pneumogastric, and indirectly through the medium of the ganglionic apparatus every where in connexion with the spinal marrow.

The foregoing considerations are indispensable to the investigations of the last periods of cholera; and without holding them in view, it is impossible to form a just appreciation of their phenomena.

There is, further, one other circumstance, it is necessary should be pointed out, before proceeding to this portion of the subject; for it forms with the preceding nearly the whole of the elements of the pathological condition constituting the last periods of cholera. This is the blood.

The sanguine fluid is so important an element of the animal organism, and so immediately engaged in every act of life, that it may well be termed the *vital fluid.* It is an essential element in each act of vitality, in each especial tissue. But, in these acts are produced the very forces or powers we name vital, as being the source of the vital actions themselves—*life is the product of life.* It is never known to be manifested, but where vitality already exists. It must have a living tissue for its origin and production. Now the blood, essential to the actions productive in the tissues of the vital forces or vital activity, is a compound fluid, composed of materials drawn from the exterior, and to the formation and perfection of which several functions are devoted. The constitution of this fluid, in the condition adapting it to the offices of vitality, is the end of the functions of digestion, excretion, and respiration—and probably others may be concerned in this great process. The sanguine element of the organism, from its compound composition, and the complex processes required for its formation, is liable to variation and deterioration in its constituent principles, and the properties that render it fitted for the production and maintenance of vital activity in the tissues. Every deviation of this fluid from its natural state must, consequently, affect the result of the vital or organic actions, either in the product of nutrition, the energy of the vital forces, or both together. The blood being also an essential element in the composition of every tissue, and of its vital or organic actions, a definite proportion belonging to each tissue in its natural condition, the sanguine fluid concurs in the production of pathological phenomena in two modes—1st, an alteration in the proportion that is natural to a tissue, to the support of its organic actions, and the production of its vital activity in their normal order; 2d, by an alteration in the constituent elements, a vitiation or deterioration of the properties of the sanguine fluid, unfitting it for the purposes of vital activity, and the vital condition of a tissue. From these principles, therefore, it is further necessary, in examining the phenomena of the last periods of cholera, to keep in view the natural constitution of the blood, the characters, so far as can be determined, essential to its adaptation to the vital condition, and what modifications and alterations it undergoes in the progress of the pathological disturbances, and the involving in the pathological state of the organs and functions concerned in its formation.

Numerous analyses have been made of the blood to determine its composition. Although some differences prevail amongst them, yet in the material facts they nearly all agree. The following is the analysis the most complete that has been attempted, and may be taken as probably the most perfect. It is by L. R. Lecanu.

| | | |
|---|---|---|
| Water | | 780.145 |
| Fibrin | | 2.100 |
| Albumen | | 65.090 |
| Fatty matter | | 3.749 |
| Colouring matter | | 133.000 |
| Extractive | | 1.790 |
| Albuminate of soda | | 1.265 |
| Muriate of soda | | 8.370 |
| Muriate of potassa | | |
| Carbonate | Alkaline | |
| Phosphate | | |
| Sulphate | | |
| Carbonate of lime | | 2.100 |
| Carbonate of magnesia | | |
| Phosphate of lime | | |
| Phosphate of magnesia | | |
| Phosphate of iron | | |
| Loss | | 2.400 |
| Total | | 1000.000 |

The blood consists of two portions intimately mixed while circulating in the large vessels. They are not combined, nor even mixed together in the circulation of all the tissues, and when the blood is taken from the body, and suffered to rest, they separate from each other. The one portion is red and solid, which remains at the bottom; the other watery and transparent, surrounds it, and rises to the surface. The first is the crassamentum, consisting of fibrin and colouring matter; the second is the serum, composed of the water, albumen and saline principles.

The vital sanguine fluid is prepared in the pulmonary parenchyma, the spongy texture of the lungs, and is the product of the function of respiration. In this process oxygen disappears from the air and is absorbed by the blood, carbonic acid is ejected from the lungs, and is eliminated from the venous or recrementitious blood, and the sanguine fluid acquires a scarlet colour. It is blood possessing this colour that alone is vital, that is capable of maintaining the actions of vitality in the animal tissues, and fitted for the development or production of the vital forces. When blood of a dark venous hue, unchanged by the function of respiration, passes into the organism, immediately is life assailed in its source in every tissue, and the functions on which the whole phenomena of life are immediately dependent at once begin to fail.

The cause of the scarlet colour of the blood has not been satisfactorily accounted for. It was generally attributed either to the absorption of the oxygen and an action it exerted on the blood, or to the escape of carbonic acid from the blood. Dr. STEVENS, formerly of St. Thomas, at present residing in London, in a work on the blood, has proposed a new theory, which he sustains by many plausible observations, and some striking experiments. He denies entirely all agency of oxygen in the production of the colour of arterial or vital sanguine fluid. Scarlet, he contends, is the natural colour of the blood derived from the action of the saline principles of this fluid on its colouring matter, or hematozine. But this colour is destroyed by the presence of free carbonic acid, which exists in venous blood, produced in the ultimate parenchyma of the organism in the acts of nutrition. As the attraction of oxygen in the lungs for carbonic acid immediately deprives the venous blood of that gas, the natural scarlet colour is then as instantly restored.

The fact is well established by the experiments of Dr. Stevens, that saline solutions do redden the blood even more than when it is merely exposed to the air; and further, that when the clot of blood has been freed, by washing in distilled water, of all its serum and saline principles, that then exposure to the air or oxygen has no influence in reddening its colour—it remains black. We do not know, however, why saline solutions produce this effect on the blood—the cause of its assuming the scarlet hue on their addition is unknown. Neither is the action of oxygen on the blood more clearly ascertained. We are not therefore authorized to infer, that because saline solutions redden blood, that oxygen cannot or does not cause the same or a similar effect. There is one fact that is conclusive, and must invalidate the theory of Dr. Stevens. When black blood is placed in the vacuum of an air-pump, by which the free carbonic acid is necessarily disengaged, instead of becoming scarlet, as it should do were the theory of Dr. Stevens correct, it actually becomes darker.

From the whole of the facts it would appear that oxygen is an active agent in the production of the scarlet hue so characteristic of the vital fluid, but that its action in this respect is facilitated by the serum of the blood, which is a weak albuminous, saline solution.

In the analysis of the blood, water is seen to constitute a very considerable portion of that fluid. The aqueous element plays a very important part in the constitution of the sanguine element, and its offices in the economy. Composing nearly eight-tenths of that fluid, it is obvious, that the watery portion enables it to fill up the large area or space formed by the immense vascular cyst continuous throughout the whole organism, arranged in the parenchymas in the form of a spongy or cellular texture, and in that of ramified tubes in the vessels. Any considerable diminution of the aqueous element of the blood must occasion an exhaustion of this great sac, and be attended with a tendency to a vacuum, occasioning a collapse or shrinking and shrivelling of the solids in the interstices, and, it is by no means an improbable supposition, between the molecules of which this vascular tissue is arranged, conveying the supplies destined for their renovation. The fulness, plumpness, and elasticity of the solids, are owing to the presence of this element in their texture—it in fact forms a very large portion of the constitution of the organs, as is proved from the great loss of weight produced by desiccation, and it is necessary to the perfection of their properties.

In another point of view, the aqueous fluid, as an element of the blood, is not less important and essential to its natural and healthful constitution. It is the vehicle or medium by which the solid portions of the blood—the globules, fibrin, and colouring matter are transported and conveyed into the interior and intimate structure. The mobility of the blood, and consequently its fitness for circulation, is wholly derived from its aqueous portion, and if this be largely diminished, the movements of the blood are embarrassed, enfeebled, and finally cease, from the viscidity of the sanguine fluid depriving it of the power of motion. To the preceding phenomenon of collapse proceeding from the exhaustion or emptiness of the angeal or vascular cyst or sac, is added the loss of the circulating movement of the blood.

The foregoing preliminary principles became indispensable to a correct appreciation of the phenomena distinctive of the second group of cases composing the third and fourth periods of cholera, but our remarks have extended to so great a length that we must postpone the investigation of these to the succeeding No. of the Journal.

---

## Art. II. *Case of Malformation, with Remarks on the Circulation of the Blood.* By Thomas Robinson, M. D. of Petersburgh, Virginia.

Early in September, 1828, while confined to bed with a remitting fever, I received an urgent summons to visit a lady whom I had seen some days before in an advanced state of pregnancy—the messenger was also desired to say that something very extraordinary had happened—this hint roused me. I dressed and repaired to the house as